

SEAL Sniper Training Program

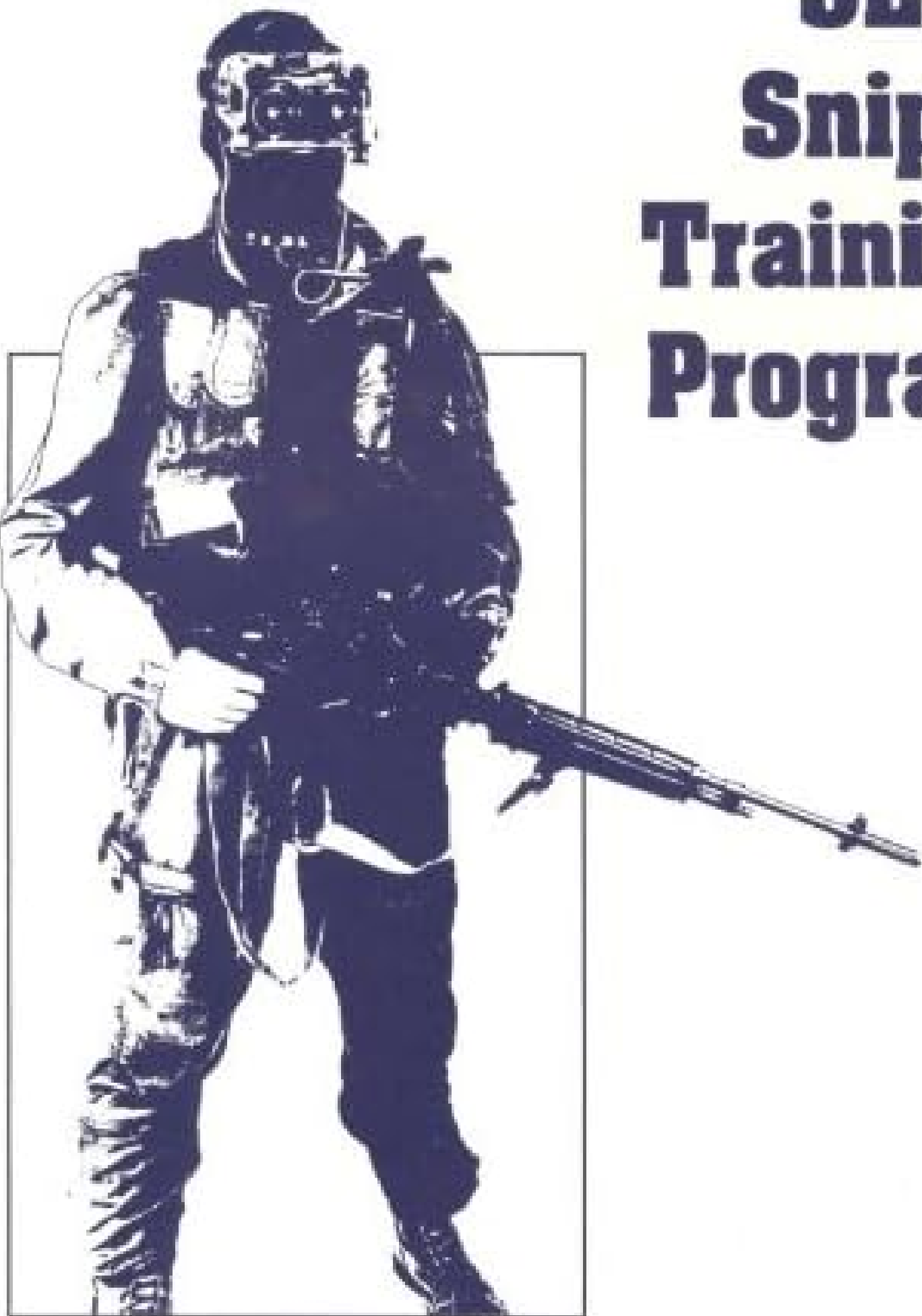


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NAVAL SPECIAL WARFARE BASIC SNIPER TRAINING SYLLABUS

NOTE. The primary mission of the SEAL scout sniper in combat is to support combat operations by delivering percision fire on selected targets from concealed postions. The SEAL sniper also has a secondary mission of gathering information for intelligence purposes. The future combat operations that would most likely involve Naval Special Warfare would be low intensity type combat operations that would employ SEAL personnel in the gathering of information for future military operations or the surgical removal of military targets and personnal with a minimal assult force with no lost of life to civilian personnel, this is the ideal mission profile to employ snipers due to their advanced field skills, marksmanship and their abilty to operate independently in a field environment.

1. HOURLY BREAKDOWN OF 9-WEEK PERIOD OF INSTRUCTION.

HOURS	SUBJECT
40	NAVAL GUN FIRE SUPPORT SCHOOL (LITTLE CREEK VA.)
4	ZEROING.
20	UNKNOWN DISTANCE FIRING.
66.5	STATIONARY TARGET FIRING (M-14/BOLT RIFLE).
31	MOVING TARGET FIRING.
8	NIGHT FIRING UNDER ARTIFICIAL ILLUMINATION.
15	SHOOTING TESTS - STATIONARY/MOVING/POPUK TARGETS.
12	COMBAT PISTOL SHOOTING.
12	HELO INSERTIONS/EXTRACTIONS-CALL FOR FIRE (4 APPLICATION EXERCISES- 2 NIGHT/2 DAY)
11.5	EMPLOYMENT/MISSION PLANING RELATED CLASSIES.
28	COMMUNICATIONS INSTRUCTION(6 APPLICATION EXERCISES) LST-5B, AN/PRC-117, PSC-3, AN/PRC-113.
42	MAPPING/AERIALPHOTO INSTRUCTION(6 APPLICATION EXERCISES)
1.5	WRITTEN TESTS.
44	STALKING EXERCISES(11 EXERCISES).
11	RANGE ESTIMATION EXERCISES(11 EXERCISES).

11	OBSERVATION EXERCISES(11EXERCISES).
6	CONCEALMENT EXCERCISES(3 EXERCISES).
10	HIDE CONSTRUCTION EXERCISE(1 EXERCISE).
72	MISSION EXERCISES(3,EACH COVERING A 24-HOUR PERIOD).
16	TACTICAL EXERCISE WITHOUT TROOPS(TEWT) (4EXERCISES).
	TOTAL HOURS
500	

2. SNIPER PROFICIENCY TRAINING.

The purpose of proficiency training is to enable the qualified SEAL scout sniper to maintain the degree of skill and proficiency to which he was trained. Proficiency training should be conducted on a quarterly in all sniper skills, although special emphasis should be made on marksmanship and stalking. These should be practiced as frequently as possible. Every effort should be made to maintain sniper proficiency.

Snipers should be requalified each year in all SEAL scout sniper skills. They should also be "quizzed" and/or tested every quarter. Proficiency training should be conducted to the same degree of standards as it was originally taught so not to lose any effectiveness in combat. If a sniper is not retained quarterly in all basic sniper skills, his quality of performance will decrease; therefore, he will not meet the standards of the SEAL scout sniper.

NOTE: SEAL scout snipers must be included, in the sniper roll, in normal SEAL tactical training and in tactical exercises.

INTERNAL SECURITY EMPLOYMENT

INTRODUCTION

1. Gain Attention. Imagine Special Warfare suddenly committed to a peace keeping force such as in Beirut, Lebanon. Or, imagine being committed to preserve the peace and protect innocent lives and property in an urban environment such as Detroit or Watts during a "Big City" riot. What is the role of the sniper? Is the sniper a valid weapon for employment in situations like this?
2. The answer is most emphatically, yes!! We have only to look around us to see examples of how effective the sniper can be in this type of situation. Probably the best examples available to us are two recent British involvements: Aden and Northern Ireland. In both cases the sniper has played a significant role in the successful British peace keeping efforts. Remember, that one of the key principles of crowd control/peace keeping is the use of only minimum force. The sniper with his selective target identification and engagement with that one well aimed shot is one of the best examples of the use of minimum force.
3. Purpose
 - a. Purpose. To provide the student with the general knowledge needed to employ a sniper section in internal security type environments.
 - b. Main Ideas. To explain the sniper's role in:
 - (1) Urban guerrilla operations.
 - (2) Hostage situations.
4. Training Objectives. Upon completion of this period of instruction, the student will be able to:
 - a. Employ a Seal sniper section in either sniper cordon, periphery, O.P. or ambush operations.
 - b. Construct and occupy an urban O. P.
 - c. Obtain and use special equipment needed for internal security operations.
 - d. Employ a Seal sniper section in a hostage situation.

e. Select a hostage situation firing position taking into consideration the accuracy requirements and effects of glass on the bullet.

BODY

1. Urban Guerrilla Warfare

a. General. The role of the sniper in an urban guerrilla environment is to dominate the area of operations by delivery of selective, aimed fire against specific targets as authorized by local commanders. Usually this authorization only comes when such targets are about to employ firearms or other lethal weapons against the peace keeping force or innocent civilians. The sniper's other role, and almost equally important, is the gathering and reporting of intelligence.

b. Tasks. Within the above role, some specific tasks which may be assigned include:

(1) When authorized by local commanders, engaging dissidents/urban guerrillas when involved in hijacking, kidnapping, holding hostages, etc.

(2) Engaging urban guerrilla snipers as opportunity targets or as part of a deliberate clearance operation.

(3) Covertly occupying concealed positions to observe selected areas.

(4) Recording and reporting all suspicious activity in the area of observation.

(5) Assisting in coordinating the activities of other elements by taking advantage of hidden observation posts.

(6) Providing protection for other elements of the peace keeping force, including fireman, repair crews, etc.

c. Limitations. In urban guerrilla operations there are several limiting factors that snipers would not encounter in a conventional war:

(1) There is no FEBA and therefore no "No Mans Land" in which to operate. Snipers can therefore expect to operate in entirely hostile surroundings in most circumstances.

(2) The enemy is covert, perfectly camouflaged among and totally indistinguishable from the everyday populace that surrounds him.

(3) In areas where confrontation between peace keeping forces and the urban guerrillas takes place, the guerrilla dominates the ground entirely from the point of view of continued presence and observation. Every yard of ground is known to them; it is ground of their own choosing. Anything approximating a conventional stalk to and occupation of, a hide is doomed to failure.

(4) Although the sniper is not subject to the same difficult conditions as he is in conventional war, he is subject to other pressures.

These include not only legal and political restraints but also the requirement to kill or wound without the motivational stimulus normally associated with the battlefield.

(5) Normally in conventional war, the sniper needs no clearance to fire his shot. In urban guerrilla warfare, the sniper must make every effort possible to determine in each case the need to open fire and that it constitutes reasonable/minimum force under circumstances.

d. Methods of Employment

(1) Sniper Cordons/Periphery O. P. 's

(a) The difficulties to be overcome in placing snipers in heavily populated, hostile areas and for them to remain undetected, are considerable. It is not impossible, but it requires a high degree of training, not only on the part of the snipers involved, but also of the supporting troops.

(b) To overcome the difficulties of detection and to maintain security during every day sniping operations, the aim should be to confuse the enemy. The peace keeping forces are greatly helped by the fact that most "trouble areas" are relatively small, usually not more than a few hundred yards in dimension. All can be largely dominated by a considerable number of carefully sited O. P. 's around their peripheries.

(c) The urban guerrilla intelligence network will eventually establish the locations of the various O. P. 's. By constantly changing the O. P.'s which are in current use it is impossible for the terrorist to know exactly which are occupied. However, the areas to be covered by the O.P.'s remain fairly constant and the coordination of arcs of fire and observation must be controlled at a high level, usually battalion. It may be delegated to company level for specific operations.

(d) The number of O.P.'s required to successfully cordon an area is considerable. Hence, the difficulties of sustaining such an operation over a protracted period in the same area should not be under-estimated.

(2) Sniper Ambush

(a) In cases where intelligence is forth coming that a target will be in a specific place at a specific time, a sniper ambush is frequently a better alternative than a more cumbersome cordon operation.

(b) Close reconnaissance is easier than in normal operation as it can be carried out by the sniper as part of a normal patrol without party to its hide undetected. To place snipers in position undetected will require some form of a deception plan. This often takes the form of a routine search operation in at least platoon strength. During the course of the search the snipers position themselves in their hide. They remain in position when the remainder of the force withdraws. This tactic is especially effective when carried out at night.

(c) Once in position the snipers must be prepared to remain for lengthy periods in the closest proximity to the enemy and their sympathizers.

(d) Their security is tenuous at best. Most urban O.P.'s have "dead spots" and this combined with the fact that special ambush positions are frequently out of direct observation by other friendly forces makes them highly susceptible to attack, especially from guerrillas armed with

with explosives. The uncertainty about being observed on entry is a constant worry to the snipers. It can and does have a most disquieting effect on the sniper and underlines the need for highly trained men of stable character.

(e) If the ambush position cannot be directly supported from a permanent position, a "back up" force must be placed at immediate notice to extract the snipers after the ambush or in the event of compromise. Normally it must be assumed that after the ambush, the snipers cannot make their exit without assistance. They will be surrounded by large, extremely hostile crowds, consequently the "back up" force must not only be close at hand but also sufficient in size.

c. Urban Sniping Hides/O.P.'s

(1) Selecting the Location. The selection of hides and O.P. positions demand great care. The over-riding requirement of a hide/O.P. position is for it to dominate its area of responsibility.

(a) When selecting a suitable location there is always a tendency to go for height. In an urban operation this can be mistake. The greater the height attained, the more the sniper has to look out over an area and away from his immediate surroundings. For example, if an O.P. were established on the 10th floor of an apartment building, to see a road beneath, the sniper would have to lean out of the window, which does little for the O.P.'s security. The locations of incidents that the sniper might have to deal with are largely unpredictable, but the ranges are usually relatively short. Consequently, an O.P. must aim to cover its immediate surroundings as well as middle and far distances. In residential areas this is rarely possible as O.P.'s are forced off ground floor level by passing pedestrians. But generally it is not advisable to go above the second floor, because to go higher greatly increases the dead space in front of the O.P. This is not a cardinal rule, however. Local conditions, such as being on a bus route, may force the sniper to go higher to avoid direct observation by passengers.

(b) In view of this weakness in local defense of urban O.P.'s, the principles of mutual support between O.P.'s assumes even greater importance. The need for mutual support is another reason for coordination and planning to take place at battalion level.

(c) The following are possible hide/O.P. locations:

(1) Old, derelict buildings. Special attention should be paid to the possibility of encountering booby traps. One proven method of detecting guerrilla booby traps is to notice if the locals (especially children) move in and about the building freely.

(2) Occupied houses. After careful observation of the inhabitants daily routine, snipers can move into occupied homes and establish hides/O.P.s in the basement and attics. This method is used very successfully by the British in Northern Ireland.

(3) Shops.

(4) Schools and Churches. When using these as hide/O.P. locations, the snipers risk possible damage to what might already be strained public relations.

(5) Factories, sheds, garages.

(6) Basements and between floors in buildings. It is possible for the sniper team to locate themselves in these positions although there may be no window or readily usable firing port available. These locations require the sniper to remove bricks or stone without leaving any noticeable evidence outside of the building. To do this the sniper must carefully measure the width of the mortar around a selected brick/stone. He must then construct a frame exactly the size of the selected brick with the frame edges exactly the size of the surrounding mortar. He then carefully removes the brick from the wall and places it in his frame. The mortar is then crushed and glued to the frame so that it blends perfectly with the untouched mortar still in place. The brick/frame combination is then placed back into the wall. From the outside, nothing appears abnormal, while inside the sniper team has created an extremely difficult to detect firing port. Care must be taken however that when firing from this position dust does not get blown about by muzzle blast and that the brick/frame combination is immediately replaced. Another difficulty encountered with this position is that it offers a very restricted field of view.

(7) Rural areas from which urban areas can be observed.

(d) An ideal hide/O.P. should have the following characteristics:

(1) A secure and quiet approach route. This should, if possible, be free of garbage cans, crumbling walls, barking dogs and other impediments.

(2) A secure entry and exit point. The more obvious and easily accessible entry/exit points are not necessarily the best as their constant use during subsequent relief of sniper teams may more readily lead to compromise.

(3) good arcs of observation. Restricted arcs are inevitable but the greater the arc the better.

(4) Security. These considerations have already been discussed above.

(5) Comfort. This is the lowest priority but never the less important. Uncomfortable observation and firing positions can only be maintained for short periods. If there is no adequate relief from observation, O.P.s can rarely remain effective for more than a few hours.

(2) Manning the O.P./Hide

(a) Before moving into the hide/O.P. the snipers must have the following information:

(1) The exact nature of the mission (i.e. observe, shoot, etc.)

(2) The length of stay.

(3) The local situation.

(4) Procedure and timing for entry.

(5) Emergency evacuation procedures.

(6) Radio procedures.

(7) Movement of any friendly troops.

(8) Procedure and timing for exit.

(9) Any special equipment needed.

(b) The well-tried and understood principle of remaining back from windows and other apertures when in buildings has a marked effect on the manning of O.P.s/hides. The field of view from the back of a room through a window is limited. To enable a worthwhile area to be covered, two or even three men may have to observe at one time from different parts of the room.

(3) Special Equipment for Urban Hides/O.P. The following equipment may be necessary for construction of or use in the urban/O.P.

- (a) Pliers. To cut wires.
- (b) Glass Cutter. To remove glass from windows.
- (c) Suction Cups. To aid in removing glass.
- (d) Rubber Headed Hammers. To use in construction of the hide with minimal noise.
- (e) Skeleton Keys. To open locked doors.
- (f) Pry Bars. To open jammed doors and windows.
- (g) Padlocks. To lock doors near hide/O.P. entry and exit points.

2. Hostage Situations

a. General. Snipers and commanding officers must appreciate that even a good, well placed shot may not always result in the instantaneous death of a terrorist. Even the best sniper when armed with the best weapon and bullet combination cannot guarantee the desired results. Even an instantly fatal shot may not prevent the death of a hostage when muscle spasms in the terrorists's body trigger his weapon. As a rule then, the sniper should only be employed when all other means of moving the situation have been exhausted.

b. Accuracy Requirements

(1) The Naval Special Warfare Sniper Rifle is the finest combat sniper weapon in the world. When using the Lake City M118 Match 7.62 mm ammunition it will constantly group to within one minute of angle or one inch at one hundred yards.

(2) Keeping this in mind, consider the size of the target in a hostage situation. Doctors all agree that the only place on a man, where if struck with a bullet instantaneous death will occur, is the head. (Generally, the normal human being will live 8-10 seconds after being shot directly in the heart.) The entire head of a man is a relatively large target measuring approximately 7 inches in diameter. But in order to narrow the odds and be more positive of an instant killing shot the size of the target greatly reduces. The portion of the brain that controls all motor reflex actions is located directly behind the eyes and runs generally from ear lobe to ear lobe and is roughly two inches wide. In reality then, the size of the snipers target is two inches not seven inches.

(3) By applying the windage and elevation rule, it is easy to see then that the average Seal sniper cannot and should not attempt to deliver an instantly killing head shot beyond 200 yards. To require him to do so, asks him to do something the rifle and ammunition combination available to him cannot do.

c. Position Selection. Generally the selection of a firing position for a hostage situation is not much different from selecting a firing position for any other form of combat. The same guidelines and rules apply. Remember, the terrain and situation will dictate your choice of firing positions. However, there are several peculiar considerations the sniper must remember:

(1) Although the sniper should only be used as a last resort, he should be moved into his position as early as possible. This will enable him to precisely estimate his ranges, positively identify both the hostages and the terrorist and select alternate firing positions for use if the situation should change.

(2) If the situation should require firing through glass, the sniper should know two things:

(a) That when the Mills ammunition penetrates glass, in most cases the copper jacket is stripped off its lead core and fragments. These fragments will injure or kill should they hit either the hostage or the terrorist. The fragments show no standard pattern but randomly fly in a cone shaped pattern much like shot from a shotgun. The lead core of the bullet does continue to fly in a straight line. Even when the glass is angled to as much as 45° the lead core will not show any signs of deflection. (back 6 feet from the point of impact with the glass).

(b) That when the bullet impacts with the glass, the glass will shatter and explode back into the room. The angle of the bullet impacting with the glass has absolutely no bearing on the direction of the flight of the shattered glass. The shattered glass will always fly perpendicular to the pane of the glass.

d. Command and Control

(1) Once the decision has been made by the commander to employ the sniper, all command and control of his actions should pass to the sniper team leader. At no time should the sniper have to fire on someone's command. He should be given clearance to fire and then he and he alone should decide exactly when.

(2) If more than one sniper team is used to engage one or more hostages it is imperative that the rule above applies to all teams. But it will be necessary for the snipers to communicate with each other. The most reliable method of accomplishing this is to establish a "land line" or TA-312 phone loop much like a gun loop used in artillery battery firing positions. This enables all teams to communicate with all the others without confusion about frequencies, radio procedure, etc.

OPPORTUNITY FOR QUESTIONS AND COMMENTS

SUMMARY

1. Reemphasize. During this period of instruction we discussed urban guerrilla operations and hostage situations. In urban guerrilla operations we outlined the tasks and limitations common to all operations. We then discussed the two methods of employing snipers: (1) sniper cordons/periphery O.P.s and (2) sniper ambushes. We discussed selecting a position

in an urban area and the most suitable locations for hides/O.P.s. Then we *looked at how to man an O.P. and what special equipment you might need to construct and work in it.*

In the discussion of hostage situations we examined the accuracy requirements and the position selection considerations common to all terrorist environments. We also discussed the command and control procedures for employing snipers in this type of role.

2. Remotivate. Remember, its not outside the realm of possibility that someday you or someone you've trained could find himself in this type of situation. At that time you'll take the test--let's hope we have no failures, because the political and social repercussions are too great a price to pay for one sniper who didn't prepare himself to put that one round on target.

OCCUPATION AND SELECTION OF POSITIONS

INTRODUCTION

1. Gain Attention. Relate story of Russian super-sniper Vassili Zaitsev and German super-sniper Major Konigs at the Battle of Stalingrad. (Excerpts from Enemy at the Gates by William Craig.)
2. Simply stated, the Specwar snipers mission is to see without being seen and to kill without being killed.
3. Purpose
 - a. Purpose. The purpose of this period of instruction is to provide the student with the knowledge required to select and occupy a position.
 - b. Main Ideas. The main ideas to be discussed are the following:
 - (1) Position Selection
 - (2) Hasty Positions
 - (3) Position Safety
 - (4) Actions in Position
4. Training Objectives. Upon completion of this period of instruction the student will:
 - a. Identify those features which contribute to the selection of a position. i. e. cover, concealment, fields of fire, avenues of approach and withdrawal, etc.
 - b. Determine, using maps, aerial photos and/or visual reconnaissance, the location of a suitable sniper position.

TRANSITION. To effectively accomplish their mission of supporting combat operations by delivering precision fire on selected targets the sniper team must select a position from which to observe and fire.

BODY

1. Position Selection. The sniper, having decided upon an area of operation, must chose a specific spot from which to operate. The sniper must not forget that a position which appears to him as an obvious and ideal location for a sniper will also appear as such to the enemy. He should avoid the obvious positions and stay away from prominent, readily

identifiable objects and terrain features. (TA) The best position represents an optimum balance between two considerations.

- a. It provides maximum fields of observation and fire to the sniper.
- b. It provides maximum concealment from enemy observation.

2. Hasty Positions. Due to the limited nature of most sniper missions and the requirement to stalk and kill, the sniper team will in most cases utilize a hasty post. Considering the fundamentals of camouflage and concealment the team can acquire a hasty sniper post in any terrain. (TA) The principle involved when assuming a hasty position is to utilize a maximum of the team's ability to blend with the background or terrain and utilize shadows at all times. Utilizing the proper camouflage techniques, while selecting the proper position from which to observe and shoot, the sniper can effectively preclude detection by the enemy. (TA) While hasty positions in open areas are the least desirable, mission accomplishment may require assuming a post in an undesirable area. Under these circumstances, extreme care must be taken to utilize the terrain (ditches, depressions, and bushes) to provide maximum concealment. The utilization of camouflage nets and covers can provide additional concealment to avoid detection. There should be no limitation to ingenuity of the sniper team in selection of a hasty sniper post. Under certain circumstances it may be necessary to fire from trees, rooftops, steeples, under logs, from tunnels, in deep shadows, and from buildings, swamps, woods and an unlimited variety of open areas.

3. Position Safety. Selection of a well covered or concealed position is not a guarantee of the sniper's safety. He must remain alert to the danger of self-betrayal and must not violate the following security precautions.

- a. When the situation permits, select and construct a sniper position from which to observe and shoot. The slightest movement is the only requirement for detection, therefore even during the hours of darkness caution must be exercised as the enemy may employ night vision equipment and sound travels great distances at night.

- b. The sniper should not be located against a contrasting background or near prominent terrain features, these are usually under observation or used as registration points.

- c. In selecting a position, consider those areas that are least likely to be occupied by the enemy.

- d. The position must be located within effective range of the expected targets and must afford a clear field of fire.

- e. Construct or employ alternate positions where necessary to effectively cover an area.

- f. Assume at all times that the sniper position is under enemy observation. Therefore while moving into position the sniper team should take full advantage of all available cover and concealment and practical individual camouflage discipline. i. e. face and exposed skin areas

camouflaged with appropriate material. The face veil should be completely covering the face and upon moving into position the veil should cover the bolt receiver and entire length of the scope.

g. Avoid making sound.

h. Avoid unnecessary movement unless concealed from observation.

i. Avoid observing over a skyline or the top of cover or concealment which has an even outline or contrasting background.

j. Avoid using the binoculars or telescope where light may reflect from lenses.

k. Avoid moving foliage concealing the position when observing.

l. Observe around a tree from a position near the ground.

m. Stay in the shadow when observing from a sniper post within a building.

n. Careful consideration must be given to the route into or out of the post. A worn path can easily be detected. The route should be concealed and if possible a covered route acquire.

o. When possible, choose a position so that a terrain obstacle lies between it and the target and/or known or suspected enemy location.

p. While on the move and subsequently while moving into or out of position all weapons will be loaded with a round in the chamber and the weapon on safe.

4. Actions in Position. After arriving in position and conducting their hasty then detailed searches, the sniper team organizes any and all equipment in a convenient manner so it is readily accessible if needed. The sniper team continues to observe and collect any and all pertinent information for intelligence purposes. They establish their own system for observation, eating, sleeping, resting and making head calls when necessary. This is usually done in time increments of 30 to 60 minutes and worked alternately between the two snipers for the entire time they are in position, allowing one of the individuals to relax to some degree for short periods. Therefore it is possible for the snipers to remain effective for longer periods of time.

The sniper team must practice noise discipline at all times while occupying their position. Therefore arm and hand signals are widely used as a means of communicating. The following are recommended for use when noise discipline is of the utmost importance.

a. Pointing at oneself; meaning I, me, mine.

b. Pointing at partner; meaning you, your, yours.

c. Thumbs up; meaning affirmative, yes, go.

- d. Thumbs down; meaning negative, no, no go.
- e. Hands over eyes; meaning cannot see.
- f. Pointing at eyes; meaning look, see, observe.
- g. Slashing stroke across throat; meaning dead, kill.
- h. Hands cupped together; meaning together.
- i. Hand cupped around ear, palm facing forward; meaning listen, hear.
- j. Fist; meaning stop, halt, hold up.
- k. Make pumping action with arm; meaning double time.

OPPORTUNITY FOR QUESTIONS

SUMMARY

1. Reemphasize. During this period of instruction we discussed position selection and the two factors necessary to all positions (1) Provides maximum fields of observation and fire to the sniper. (2) It provides maximum concealment from enemy observation.

We then covered selection of hasty positions and that mission accomplishment might require of hasty positions and that mission accomplishment might require assuming a position in an undesirable area. All available terrain should be used to provide maximum concealment under these circumstances.

In conclusion we covered a number of safety precautions to be considered while on the move and in the process of moving into and out of position.

2. Remotivate. How well the sniper team accomplishes the mission depends, to a large degree, on their knowledge, understanding, and application of the various field techniques or skills that allows them to move, hide, observe, and detect. These skills are a measure of the sniper's ability to survive.

RANGE ESTIMATION TECHNIQUES

INTRODUCTION

1. Gain Attention. Everyone has had to estimate the distance from one point to another at some time. Usually an estimate was made either because no tool was available for exact measurements or because time did not allow such a measurement.

2. As a sniper, in order to engage a target accurately, you will be required to estimate the range to that target. However, unlike with many of your early experiences, a "ball-park guesstimate" will no longer suffice. You will have to be able to estimate ranges out to 1000 yards with 90% accuracy.

3. Purpose

a. Purpose. To acquaint the student with the various techniques of range estimation he will use in his role as a sniper.

b. Main Ideas. Describe the use of maps, the 100 meter method, the appearance of objects method, the bracketing method, the averaging method, the range card method and the use of the scope reticle in determining range.

4. Training Objectives. Upon completion of this period of instruction, the student will:

a. Determine range with the aid of a map.

b. Demonstrate the other techniques for determining range by eye.

c. Identify those factors which effect range estimation.

TRANSITION. The sniper's training must concentrate on methods which are adaptable to the sniper's equipment and which will not expose the sniper.

BODY A. METHODS OF RANGE ESTIMATION

1. Use of Maps. When available, maps are the most accurate aid in determining range. This is easily done by using the paper-strip method for measuring horizontal distance.

2. The 100 Meter Unit of Measure Method.

a. Techniques. To use this method, the sniper must be able to visualize a distance of 100 meters on the ground. For ranges up to 500 meters, he

determines the number of 100 meter increments between the two points. Beyond 500 meters, he selects a point midway to the targets, determine the number of 100 meter increments to the halfway point, and doubles the result.

b. Ground which slopes upward gives the illusion of greater distance, while ground sloping downward gives an illusion of shorter than actual distance.

c. Attaining Proficiency. To become proficient with this method of range estimation, the sniper must measure off several 100 meter courses on different types of terrain, and then, by walking over these courses several times, determines the average number of paces required to cover the 100m of the various terrains. He can then practice estimation by walking over unmeasured terrain, counting his paces, and marking off 100m increments. Looking back over his trail, he can study the appearance of the successive increments. Conversely, he can estimate the distance to a given point, walk to it counting his paces, and thus check his accuracy.

d. Limitations. The greatest limitation to the 100m unit of measure method is that it's accuracy is directly related to how much of the terrain is visible to the observer. This is particularly important in estimating long ranges. If a target appears at a range of 100 meters or more, and the observer can only see a portion of the ground between himself and the target, the 100m unit of measure cannot be used with any degree of accuracy.

3. Appearance-of-Objects Method.

a. Techniques. This method is a means of determining range by the size and other characteristic details of some object. For example, a motorist is not interested in exact distance, but only that he has sufficient road space to pass the car in front of him safely. Suppose however, that a motorist knew that a distance of 1 kilometer (Km), an oncoming vehicle appeared to be 1 inch high, 2 inches wide, with about $\frac{1}{2}$ inch between the headlights. Then, any time he saw oncoming vehicles that fit these dimensions, he would know that they were about 1 Km away. This same technique can be used by snipers to determine range. Aware of the sizes and details of personnel and equipment at known ranges, he can compare these characteristics to similar objects at unknown distances, and thus estimate the range.

b. To use the appearance-of-objects method with any degree of accuracy, the sniper must be thoroughly familiar with the characteristic details of objects as they appear at various ranges. For example, the sniper should study the appearance of a man at a range of 100 meters. He fixes the man's appearance firmly in his mind, carefully noting details of size and the characteristics of uniform and equipment. Next, he studies the same man in the kneeling position and then in the prone position. By comparing the appearance of these positions at known ranges from 100-500m, the sniper can establish a series of mental images which will help him in determining ranges on unfamiliar terrain. Practice time should also be devoted to the appearance of other familiar objects such as weapons and vehicles.

c. Limitations. Because the successful use of this method depends upon visibility, or anything which limits visibility, such as smoke, weather or darkness, will also limit the effectiveness of this method.

4. Combination of Methods. Under proper conditions, either the 100m unit of measure or the appearance-of-objects method of determining range will work, however, proper conditions rarely exist on the battlefield. Consequently, the sniper will be required to use a combination of methods. Terrain can limit the accuracy of the 100m unit of measure method and visibility can limit the appearance-of-objects method. For example, an observer may not be able to see all of the terrain out to the target, but he may see enough to get a fair idea of the distance. A slight haze may obscure many of the target details, but the observer can still make some judgment of it's size. Thus, by carefully considering the results of both methods, an experienced observer should arrive at a figure close to the true range.

5. Bracketing Method. By this method, the sniper assumes that the target is no more than "X" meters, but no less than "Y" meters away; he uses the average as the estimation of range.

6. Averaging Method. Snipers can increase the accuracy of range estimation by eye by using an average of the individual team members estimations.

7. Range Card Method. Information contained on prepared range cards establishes reference points from which the sniper can judge ranges rapidly and accurately. When a target appears, it's position is determined in relation to the nearest object or terrain feature drawn on the range card. This will give an approximation of the targets range. The sniper determines the difference in range between the reference point and the target, and sets his sights for the proper range, or uses the correct hold off.

8. Range Estimation Formula Method. This method requires the use of either binoculars or telescopic sights equipped with a mil scale. To use the formula, the sniper must know the average size of a man or any given piece of equipment and he must be able to express the height of the target in yards. The formula is:
$$\frac{\text{SIZE OF OBJ. (IN YDS)} \times 1000}{\text{SIZE OF OBJ. (IN MILS)}} = \text{RANGE TO TARGET}$$

For example: A sniper, looking through his scope sees a man standing. He measures the size of the man, using the mil scale on the reticle, and he sees that the man is 4 mils high. He knows that the average man is five and a half feet tall. To convert 6 feet to yards, he divides by 3 and finds that the man is 2.0 yards tall. Using the Formula:

$$\frac{\text{SIZE OF OBJ (IN YDS)} \quad 2.0 \times 1000}{\text{SIZE OF OBJ (IN MILS)} \quad 4} = \frac{2000}{4} = 500 \text{ yards}$$

Once the formula is understood, the sniper needs only to be able to estimate the actual height of any target and he can determine the range to that target extremely accurately.

b. Limitations. While this formula can be extremely accurate, it does have several limitations.

(1) At long ranges, measurement in mils must be precise to the nearest half mil or a miss will result. For example; If a man standing appears to the 1½ mils high, he is 1333 yds away. If he appears to be 2 mils high, he is only 1000 yds away. Careless measurement could result in a range estimation error of 333 yds in this case.

(2) This formula can be worked quickly, even if the computations are done mentally. However, as with any formula, care must be taken in working it or a totally wrong answer can result, and

(3) The formula depends entirely on the sniper's ability to estimate the actual height of a target in yards.

B. FACTORS EFFECTING RANGE ESTIMATION

1. Nature of the Target

a. An object of regular outline, such as a house, will appear closer than one of irregular outline, such as a clump of trees.

b. A target which contrasts with it's background will appear to be closer than it actually is.

c. A partially exposed target will appear more distant than it actually is.

2. Nature of Terrain. The observer's eye follows the irregularities of terrain conformation, and he will tend to overestimate distance values. In observing over smooth terrain such as sand, water, or snow, his tendency is to underestimate.

3. Light Conditions. The more clearly a target can be seen, the closer it appears. A target in full sunlight appears to be closer than the same target when viewed at dusk or dawn, through smoke, fog or rain. The position of the sun in relation to the target also affects the apparent range. When the sun is behind the viewer, the target appears to be closer. When the sun is behind the target, the target is more difficult to see, and appears to be farther away.

OPPORTUNITY FOR QUESTIONS AND COMMENTS

SUMMARY

1. Reemphasize. We have seen various ways to estimate range. Each one of them works well under the conditions for which it was devised, and when used in combination with one another, will suit any condition of visibility or terrain.

2. Remotivate. The accuracy of the shot you will fire will depend to a large extent on whether or not you have applied the rules for range estimation. Remember, if you cannot determine how far your target is away from you, you would just as well have left your rifle in the armory.

METRIC/ENGLISH
EQUIVELANTS

<u>METRIC</u> <u>1 MOA</u> <u>(CM)</u>	<u>YDS</u>	<u>YDS/METERS</u>	<u>METERS</u>	<u>ENGLISH</u> <u>1 MOA</u> <u>(IN)</u>
3	109	100	91	1
4.5	164	150	137	1.5
6	219	200	183	2
7.5	273	250	228	2.5
9	328	300	274	3
10.5	383	350	320	3.5
12	437	400	365	4
13.5	492	450	411	4.5
15	546	500	457	5
16.5	602	550	503	5.5
19	656	600	549	6
19.5	711	650	594	6.5
21	766	700	640	7
22.5	820	750	686	7.5
24	875	800	731	8
25.5	929	850	777	8.5
27	984	900	823	9
28.5	1039	950	869	9.5
30	1094	1000	914	10
31.5	1148	1050	960	10.5
33	1203	1100	1005	11

RANGE ESTIMATION TABLE FOR SIX FOOT MAN

Average Standing Man - 6 Feet Tall/2 Yards Tall

Average Sitting/Kneeling Man - 3 Feet Tall/1 Yard Tall

<u>HEIGHT IN MILS</u>	<u>STANDING RANGE</u>	<u>SITTING/KNEELING RANGE</u>
1	2000	1000
1.5	1333	666
2	1000	500
2.5	800	400
3	666	333
3.5	571	286
4	500	250
4.5	444	222
5	400	200
5.5	364	182
6	333	167
6.5	308	154
7	286	143
7.5	267	133
8	250	125
8.5	235	118
9	222	111
9.5	211	105
10	200	100

RANGE ESTIMATION TABLE OF MILS
FOR PERSONNEL - 6', 5'9" and 5'6"

<u>MILS</u>	<u>6'-2YDS</u>	<u>5'9"-1.9 YDS</u>	<u>5'6"-1.8 YDS</u>
1	2000	1900	1800
1-1/4	1600	1520	1440
1-1/2	1333	1266	1200
1-3/4	1143	1085	1028
2	1000	950	900
2-1/4	888	844	800
2-1/2	800	760	720
2-3/4	727	690	654
3	666	633	600
3-1/4	615	584	553
3-1/2	571	542	514
3-3/4	533	506	480
4	500	475	450
4-1/4	470	447	423
4-1/2	444	422	400
4-3/4	421	400	378
5	400	380	360
5-1/4	380	361	342
5-1/2	362	345	327
5-3/4	347	330	313
6	334	316	300
6-1/4	320	304	288
6-1/2	308	292	277
6-3/4	296	281	266
7	286	271	257
8	250	237	225
9	222	211	200
10	200	100	180

TECHNIQUES OF CAMOUFLAGE

INTRODUCTION

1. Gain Attention. Most uninformed people envision a sniper to be a person with a high powered rifle who either takes pot shots at people from high buildings or ties himself in a coconut tree until he's shot out of it. But to the enemy, who knows the real capabilities of a sniper, he is a very feared ghostly phantom who is never seen, and never heard until his well aimed round cracks through their formation and explodes the head of their platoon commander or radio man. A well trained sniper can greatly decrease the movement and capabilities of the most disciplined troops because of the fear of this unseen death.

2. This gives one example of how effective snipers can be and how the possibility of their presence can work on the human mind. But, marksmanship is only part of the job. If the sniper is to be a phantom to the enemy, he must know and apply the proper techniques of camouflage. He cannot be just good at camouflage. He has to be perfect if he is to come back alive.

3. Purpose

a. Purpose. The purpose of this period of instruction is to provide the student with the basic knowledge to be able to apply practically, the proper techniques of camouflage and concealment needed to remain undetected in a combat environment.

b. Main Ideas. The main ideas which will be discussed are the following:

- (1) Target Indicators
- (2) Types of Camouflage
- (3) Geographical Areas
- (4) Camouflage During Movement
- (5) Tracks and Tracking

4. Training Objectives. Upon completion of this period of instruction, the student will:

a. Camouflage his uniform and himself by using traditional or expedient methods as to resemble closely the terrain through which he will move.

b. Camouflage all of his equipment to present the least chance of detection.

c. Know and understand the principles which would reveal him in combat and how to overcome them.

d. Understand the basic principles of tracking and what information can be learned from tracking.

BODY

1. Target Indicators

a. General. A target indicator is anything a sniper does or fails to do that will reveal his position to an enemy. A sniper has to know and understand these indicators and their principles if he is to keep from being located and also that he may be able to locate the enemy. Additionally, he must be able to read the terrain to use the most effective areas of concealment for movement and firing positions. Furthermore, a sniper adapts his dress to meet the types of terrain he might move through.

b. Sound. Sound can be made by movement, equipment rattling, or talking. The enemy may dismiss small noises as natural, but when someone speaks he knows for certain someone is near. Silencing gear should be done before a mission so that it makes no sound while running or walking. Moving quietly is done by slow, smooth, deliberate movements, being conscious of where you place your feet and how you push aside bush to move through it.

c. Movement. Movement in itself is an indicator. The human eye is attracted to movement. A stationary target may be impossible to locate, a slowly moving target may go undetected, but a quick or jerky movement will be seen quickly. Again, slow, deliberate movements are needed.

d. Improper Camouflage. The largest number of targets will usually be detected by improper camouflage. They are divided into three groups.

(1) Shine. Shine comes from reflective objects exposed and not toned down, such as belt buckles, watches, or glasses. The lenses of optical gear will reflect light. This can be stopped by putting a paper shade taped to the end of the scope or binoculars. Any object that reflects light should be camouflaged.

(2) Outline. The outline of items such as the body, head, rifle or other equipment must be broken up. Such outlines can be seen from great distances. Therefore, they must be broken up into features unrecognizable, or unnoticable from the rest of the background.

(3) Contrast with the Background. When using a position for concealment, a background should be chosen that will absorb the appearance of the sniper and his gear. Contrast means standing out against the background, such as a man in a dark uniform standing on a hilltop against the sky. A difference of color or shape from the background will usually be spotted. A sniper must therefore use the coloring of his background and stay in shadows as much as possible.

2. Types of Camouflage

a. Stick Camouflage. In using the "grease paint", all the exposed skin should be covered, to include the hands, back of the neck, ears, and face. The parts of the face that naturally form shadows should be lightened. The predominate features that shine, should be darkened, such as the forehead, cheeks, nose and chin. The pattern and coloring that should be used is one that will blend with the natural vegetation and shadows. For jungle or woodland, dark and light green are good. White and gray should be used for snow areas, and light brown and sand coloring for deserts.

(1) Types of Patterns. The types of facial patterns can vary from irregular stripes across the face to bold splotching. The best pattern, perhaps, is a combination of both stripes and splotches. What one does not want is a wild type design and coloring that stands out from the background.

b. Camouflage Clothing.

(1) The Ghillie Suit. The guillie suit is an outstanding form of personal camouflage. It is used by both the British and Canadian Snipers to enable them to stalk close to their targets undetected. The ghillie suit is a camouflage uniform or outer smock that is covered with irregular patterns of garnish, of blending color, attached to it. It also has a small mesh netting sewn to the back of the neck and shoulders, and then draped over the head for a veil. The veil is used while in position to break up the outline of the head, hid the rifle scope, and allow movement of the hands without fear of detection. The veil when draped over the head should come down to the stomach or belt and have camouflaged garnish tied in it to break up the outline of the head and the solid features of the net. When the sniper is walking, he pushes the veil back on his head and neck so that he will have nothing obstructing his vision or hindering his movements. The veil is, however, worn down while crawling into position or while near the enemy. The ghillie suit, though good, does not make one invisible. A sniper must still take advantage of natural camouflage and concealment. Also wearing this suit, a sniper would contrast with regular troops, so it would only be worn when the sniper is operating on his own.

(2) Field Expedients. If the desired components for the construction of a ghillie suit are not on hand, a make-shift suit can be made by expedient measures. The garnish can be replaced by cloth discarded from socks, blankets, canvas sacks, or any other material that is readily available. The material is then attached to the suit in the same way. What is important is that the texture and outline of the uniform are broken. The cloth or any other equipment can be varied in color by using mud, coffee grounds, charcoal, or dye. Oil or grease should not be used because of their strong smell. Natural foliage helps greatly when attached to the artificial camouflage to blend in with the background. It can be attached to the uniform by elastic bands sewn to the uniform or by the use of large rubber bands cut from inner tubes. Care must be taken that the bands are not tight enough to restrict movement or the flow of blood. Also as foliage grows old, or the terrain changes, it must be changed.

c. Camouflaging Equipment

(1) One of the objects of primary concern for camouflage is the rifle. One has to be careful in camouflaging the rifle that the operation

is not interfered with, the sight is clear, and nothing touches the barrel. Camouflage netting can be attached to the stock, scope and sling, then garnish tied in it to break up their distinctive outline.

The M-16 and M-14 can be camouflaged in the same way ensuring that the rifle is fully operational.

(2) Optical Gear such as a spotting scope and binoculars are camouflaged in the same manner. The stand is wrapped or draped with netting and then garnish is tied into it. Make sure that the outline is broken up and the colors blend with the terrain. The binoculars are wrapped to break their distinctive form. Since the glass reflects light, a paper hood can be slipped over the objective lens on the scope or binoculars.

(3) Packs and Web Gear. Web gear can be camouflaged by dying, tying garnish to it, or attaching netting with garnish. The pack can be camouflaged by laying a piece of netting over it, tied at the top and bottom. Garnish is then tied into the net to break up the outline.

3. Geographic Areas

a. General. One type of camouflage naturally can not be used in all types of terrain and geographic areas. Before operations in an area, a sniper should study the terrain, vegetation and lay of the land to determine the best possible type of personal camouflage.

(1) Snow. In areas with heavy snow or in wooded areas with trees covered with snow, a full white camouflage suit is worn. With snow on the ground and the trees are not covered, white trousers and green-brown tops are worn. A hood or veil in snow areas is very effective. Firing positions can be made almost totally invisible if made with care. In snow regions, visibility during a bright night is as good as in the day.

(2) Desert. In sandy and desert areas, texture camouflage is normally not necessary, but full use of the terrain must be made to remain unnoticed. The hands and face should be blended into a solid tone using the proper camouflage stick, and a hood should be worn.

(3) Jungle. In jungle areas, foliage, artificial camouflage, and camouflage stick are applied in a contrasting pattern with the texture relative to the terrain. The vegetation is usually very thick so more dependence can be made on using the natural foliage for concealment.

4. Camouflage During Movement

a. Camouflage Consciousness. The sniper must be camouflage conscious from the time he departs on a mission until the time he returns. He must constantly observe the terrain and vegetation change. He should utilize shadows caused by vegetation, terrain features, and cultural features to remain undetected. He must master the techniques of hiding, blending, and deceiving.

(1) Hiding. Hiding is completely concealing yourself against observation by laying yourself in very thick vegetation, under leaves, or however else is necessary to keep from being seen.

(2) Blending. Blending is what is used to the greatest extent in camouflage, since it is not always possible to completely camouflage in such a way as to be indistinguishable from the surrounding area. A sniper must remember that his camouflage need be so near perfect that he should fail to be recognized through optical gear as well as with the human eye. He must be able to be looked at directly and not be seen. This takes much practice and experience.

(3) Deceiving. In deceiving, the enemy is tricked into false conclusion regarding the sniper's location, intentions, or movement. By planting objects such as ammo cans, food cartons, or something to intrigue the enemy, that he may be decoyed into the open where he can be brought under fire. Mannequins can be used to lure the enemy sniper into firing, thereby revealing his position.

5. Tracks and Tracking.

a. General. Once a sniper has learned camouflage and concealment to perfection, he must go one step further. This is the aspect of him leaving no trace of his presence, activities or passage in or through an area. This is an art in itself, and is closely related to tracking, which can tell you in detail about the enemy around you.

(1) Enemy Trackers or Scouts. It is said that the greatest danger to a sniper is not the regular enemy soldier, but in fact, is hidden booby traps, and the enemy scout who can hunt the sniper on his own terms. If an enemy patrol comes across unfamiliar tracks in it's area of operation, it may be possible for them to obtain local trackers. If it is a man's livelihood to live by hunting, he will usually be very adept at tracking. What a professional can read from a trail is truly phenomenal. Depending on the terrain, he will be able to determine the exact age of the trail, the number of persons in the party, if they are carrying heavy loads, how well trained they are by how well they move, their nationality, by their habits and boot soles, how fast they are moving and approximately where they are at the moment. If a tracker determines a fresh trail to be a party of four, who, but recon and sniper teams move in such small groups behind enemy lines? The enemy will go to almost any extreme to capture or kill them.

(2) Hiding Personal Signs. A modern professional tracker who makes his living of trailing lost children, hunters, or escaped convicts, was once asked, "Can a man hide his own trail well enough that a tracker cannot follow him?" The professional tracker answered, "NO, there is no way to hide a trail from a true tracker." The chances in combat of being pitted against a "real tracker" are rare, but all it takes is one time. This is to emphasize the importance of leaving no signs at all for the enemy scout to read. This is done by paying particular attention to where and how you walk, being sure not to walk in loose dirt or mud if it can be avoided, and not scuffing the feet. Walking on leaves, grass, rocks, etc. can help hide tracks. Trails are also made by broken vegetation

such as weeds, limbs, scrape marks on bushes, and limbs that have been bent in a certain direction. When moving through thick brush, gently move the brush forward, slip through it, then set it back to its normal position. Mud or dirt particles left on rocks or exposed tree roots are a sign of one's presence. Even broken spider webs up to the level of a man's height show movement. In the process of hiding his trail, a sniper must remember to leave no debris such as paper, C-Ration cans, spilled food, etc. behind him. Empty C-Ration cans, can either be carried out, or smashed, buried, and camouflaged. Along this same line, a hole should be dug for excrement, then camouflaged. The smell of urine on grass or bushes lasts for many days in a hot humid environment, so a hole should be dug for this also. One last object of importance, the fired casings from the sniper rifle must always be brought back, for they are a sure sign of a sniper's presence.

(3) Reading Tracks and Signs. To be proficient at tracking takes many years of experience, but a knowledgeable sniper can gain much information from signs left by the enemy. For instance, he can tell roughly the amount of enemy movement through a given area, what size units they move in, and what areas they frequent the most. If an area is found where the enemy slept, it may be possible to determine the size of the unit, how well disciplined they are, by the security that was kept, and their overall formation. It can be fairly certain that the enemy is well fed if pieces of discarded food or C-Ration cans with uneaten food in them are found. The opposite will also be true for an enemy with little food. Imprints in the dirt or grass can reveal the presence of crew-served weapons, such as machine guns or mortars. Also, prints of ammo cans, supplies, radio gear may possibly be seen. The enemy's habits may come to light by studying tracks so that he may be engaged at a specific time and place.

OPPORTUNITY FOR QUESTIONS AND COMMENTS

SUMMARY

1. Reemphasize. During this period of instruction, we have discussed target indicators, types of camouflage, geographical areas, and tracks. Initially, we covered what a target indicator is, and that sound, movement, and improper camouflage make up indicators. Care must be taken that shine, outline, and contrast with the background are eliminated.

We learned the different types of camouflage, such as grease paint, and how to tone down the skin with it, the ghillie suit, used as camouflaged clothing, and field expedient measures for camouflaging clothing and equipment. In the section on geographical areas, we learned the different types of camouflage used in the various climate regions.

The fourth area covered was concealment during movement and how to use terrain features. We learned the difference in hiding, blending, and deceiving, and how to use each. We learned of the danger of enemy scouts or trackers, and the importance of leaving no indication of one's presence while on a mission. Lastly, we covered what a sniper can learn from enemy tracks if he is observant enough to see them and takes the time to learn their meaning.

2. Remotivate. The job of a sniper is not for a person who just wants the prestige of being called a sniper. It is a very dangerous position even if the sniper is well trained and highly motivated. Expertise at camouflage to remain unnoticed takes painstaking care, and thoroughness which the wrong type of individual would not take time to do. If you are to be successful at camouflage and concealment, it takes a double portion in carefulness on your part, if you are to come back alive.

3. Concealment

a. Concealed Approaches. It is essential that the natural appearance of the ground remains unaltered, and that any camouflage done is of the highest order. The sniper must also remember that though cover from view is cover from aimed fire, all concealment will be wasted if the sniper is observed as he enters the hide. It follows, therefore, that concealed approaches to the hide are an important consideration, and movement around it must be kept to a minimum. Efforts must be made to restrict entry to and exit from the hide prior to darkness. Track discipline must be rigidly enforced.

b. Screens. Any light shining from the rear of a hide through the front loophole may give the position away. It is necessary, therefore, to put a screen over the entrance to the hide, and also one over the loophole itself. The two screens must never be raised at the same time. Snipers must remember to lower the entrance screen as soon as they are in the hide and to lower the loophole screen before leaving it. These precautions will prevent light from shining directly through both openings.

c. Loopholes. Loopholes must be camouflaged using foliage or other material which blends with or is natural to the surroundings. Logically, anything not in keeping with the surroundings will be a source of suspicion to the enemy and hence a source of danger to the sniper.

d. Urban Areas. In urban areas, a secure and quiet approach with the minimum number of obstacles such as crumbling wall and barking dogs is required. When necessary, a diversion in the form of a vehicle or house search can be set up to allow the sniper the use of the cover of a vehicle to approach the area unseen and occupy the hide.

4. The Use Of Buildings And Hides As Fire Positions.

a. Disadvantages. Buildings can often offer good opportunities as sniping posts under static conditions. They suffer, however, the great disadvantage that they may be the object of attention from the enemy's heavier weapons. Isolated houses will probably be singled out even if a sniper using it has not been detected.

b. Preparation. Houses should be prepared for use in much the same way as other hides, similar precautions towards concealment being taken; loopholes being constructed and fire positions made.

c. Outward Appearance. Special care must be taken not to alter the outward appearance of the house by opening windows or doors that were found closed, or by drawing back curtains.

d. Free Positions. The actual fire positions must be well back in the shadow of the room against which the sniper might be silhouetted, must be screened.

e. Loopholes. Loopholes may be holes in windows, shutters of the roof, preferable those that have been made by shells of other projectiles. If such loopholes have been picked out of a wall, they must be made to look like war damage.

f. Observation Rest. Some form of rest for the firer and observer will have to be constructed in order to obtain the most accurate results. Furniture from the house, old mattresses, bedspreads and the like will serve the purpose admirably; if none of this material is available, sandbags may have to be used.

5. Firing From Hides.

a. Fire Discipline. Fire from a hide must be discreet and only undertaken at specific targets. Haphazard harassing fire will quickly lead to the enemy locating the hide and directing fire to it.

b. Muzzle Flash. At dusk and dawn, the flash from a shot can usually be clearly seen and care must be taken not to disclose the position of the hide when firing under such circumstances.

c. Rifle Smoke. On frosty mornings and damp days, there is a great danger of smoke from the rifle giving the position away. On such occasions, the sniper must keep as far back in the hide as possible.

d. Dust. When the surroundings are dry and dusty, the sniper must be careful not to cause too much dust to rise. It may be necessary to dampen the surroundings of the loophole and the hide when there is a danger of rising dust.

6. Types of Hides. A hide can take many forms. The type of operation or the battle situation coupled with the task the snipers are given, plus the time available, the terrain and above all, the ingenuity and inventiveness of the snipers, will decide how basic or elaborate the hide can or must be. In all situations, the type of hide will differ, but the net result is the same, the sniper can observe and fire without being detected.

a. Belly Hide. This type hide is best used in mobile situations or when the sniper doesn't plan to be in position for any extended period of time. Some of the advantages and disadvantages are:

- (1) It is simple and can be quickly built.
- (2) Good when the sniper is expected to be mobile, because many can be made.

Disadvantages

- (1) It is uncomfortable and cannot be occupied for long periods of time.

b. Enlarged Fire Trench Hide. This type hide is nothing more than an enlarged fighting hole with advantages being:

- (1) Able to maintain a low silhouette,
- (2) Simple to construct,
- (3) Can be occupied by both sniper and observer,
- (4) It can be occupied for longer periods of time with some degree of comfort.

Disadvantages

- (1) It is not easily entered or exited from.
- (2) There is no overhead cover when in firing position.

c. Semi-Permanent Hide. This type hide resembles a fortified bunker and should always be used if time circumstances permit. The advantages are:

- (1) Can be occupied for long periods of time,
- (2) Gives protection from fire and shrapnel,
- (3) Enables movement for fire and observation,
- (4) Provides some comfort.

Disadvantages

- (1) Takes time to construct
- (2) Equipment such as picks, shovels, axes, etc. are needed for construction.

d. Shell Holes. Building a hide in a shell hole saves a lot of digging, but needs plenty of wood and rope to secure the sides. Drainage is the main disadvantage of occupying a shell hole as a hide.

e. Tree Hides. In selecting trees for hides, use trees that have a good deep root such as oak, chestnut, hickory. During heavy winds, these trees tend to remain steady better than a pine which has surface roots and sways quite a bit in a breeze. A large tree should be used that is back from the wood line. This may limit your field of view, but it will better cover you from view.

OPPORTUNITY FOR QUESTIONS AND COMMENTS

SUMMARY

1. Reemphasize. During this period of instruction, we covered the complete construction of hides and locating the best area of this construction. It should be stressed that the sniper should use his own imagination and initiative while constructing his hide. In conclusion, we discussed the various types of hides, advantages and disadvantages and in what situation a particular hide could be best used.

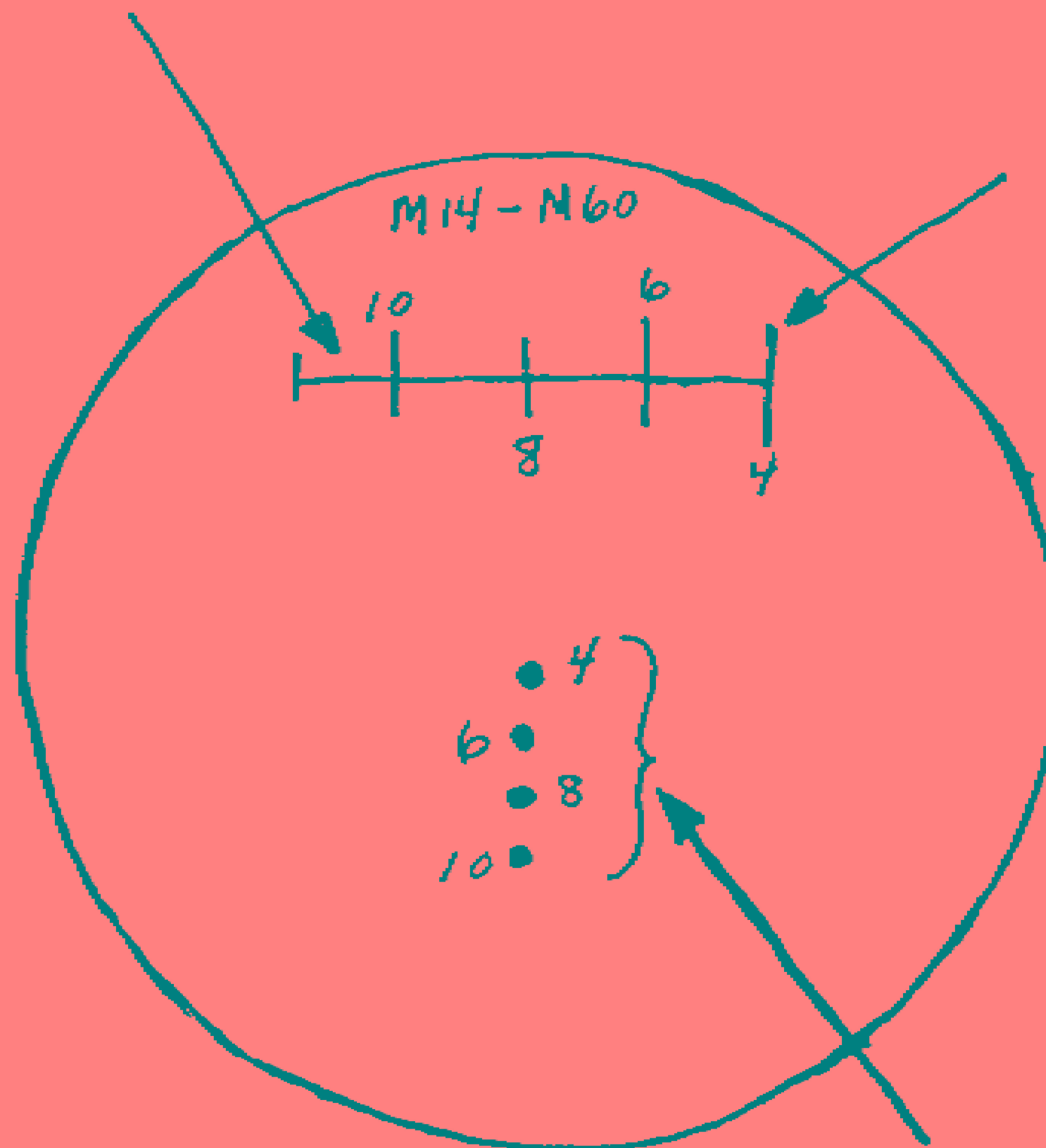
2. Remotivate. The type of hide you build will depend on a great many things. Time, Terrain, Type of Operation, Enemy Situation, and Weapons. So always construct a good defensive hide. It will keep you effective and keep you alive.

INTRODUCTION OF NIGHT VISION DEVICES

The objective of this lesson was to enable you to engage targets during hours of limited visibility with the night vision device by proper mounting, operation, and maintenance of this piece of equipment, and explain the capabilities and limitations of each.

1. In order to effectively engage targets during hours of limited visibility, you must know proper procedure for mounting, operation, and operator maintenance of the NVD.
2. The adaptor bracket must be aligned with the mounting groove on the left side of the receiver and tightened securely with an allen wrench before the sight assembly can be installed, by rotating the lock knobs counterclockwise until they stop on the pins on the assembly. You then slide the boresight onto the guide rail until it is positioned against the pinstop. The last step in mounting is to tighten the lock knob by turning clockwise.
3. The first point to remember about operation of the NVD is the mercury battery is irritable to the eyes and other mucus membranes. Even though the image intensifier will turn off automatically to protect the observer, the image intensifier should never be pointed at the sun on or off. The NVD will always be inspected before use. The operational sequence is definite as should always be followed.
4. The NVD will operate from -65°F to; -125°F and the lenses will have to be cleaned frequently in sandy or dusty areas and will also operate in wet or humid areas.
5. Operator maintenance can be performed with the tools and equipment provided with the exception of a screwdriver and should be followed step-by-step. Above all, never use lubricating materials on the NVD.
6. To complicate training, the two scopes in the system (AN/PVS-2 and AN/PVS-4) have some important differences:
 - a. They require different zero procedures.
 - b. They have totally different reticles.
 - c. They have different mounting and dismounting procedures.
 - d. Windage and elevation adjustments on the AN/PVS-2 are made in the direction of the error, while adjustments on the AN/PVS-4 are made in the direction of the desired point of impact.
7. At 25 meters, the point of impact for the AN/PVS-2 is 1.2 cm high and 3.8 cm right. The AN/PVS-4 is 1.4 cm high.

Horizontal line from left
point of origin
20 feet at ranges shown.
Range is in hundreds of meters.

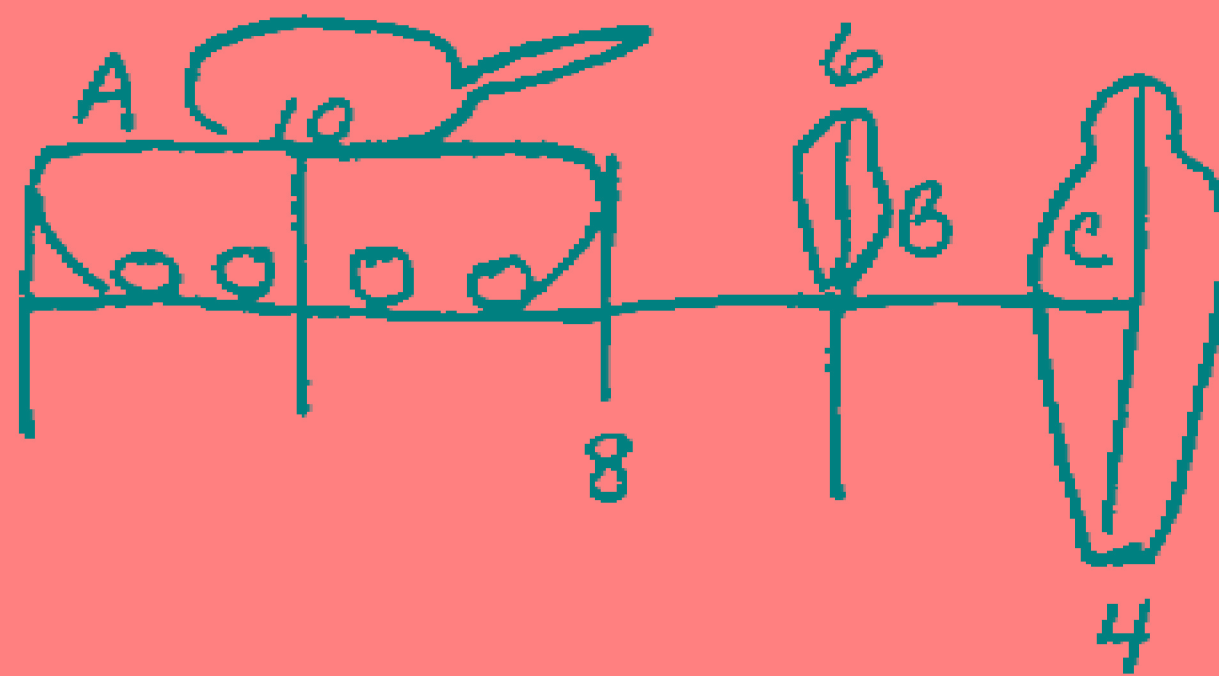


Vertical lines above or
below horizontal line
represent 6 feet at ranges
shown. Range is in
hundreds of meters.

M14-M60 Aiming points.
Range is in hundreds of
meters.

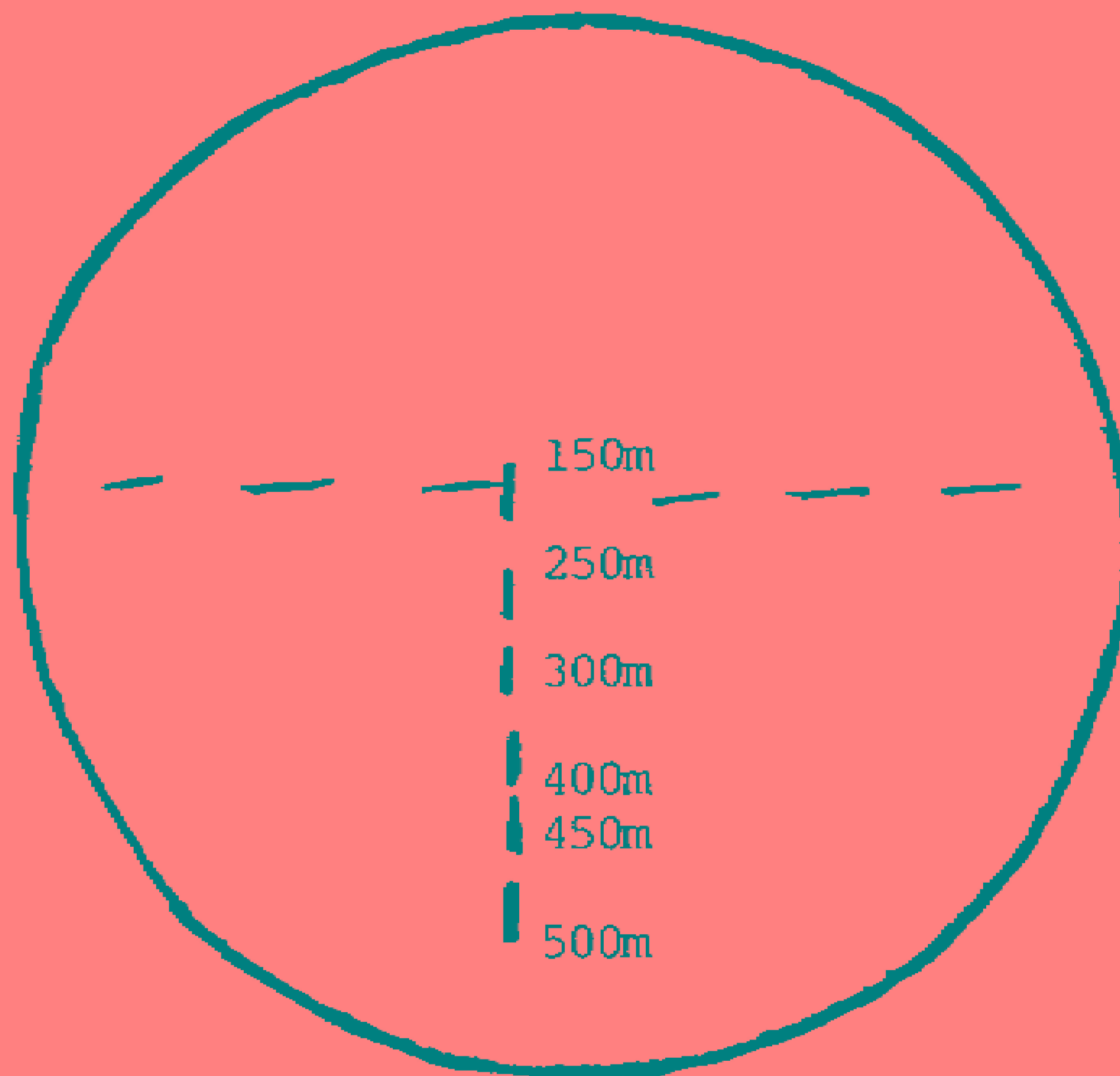
Use center of two horizontal
lines for 0-250 meters.

Example:



- A) Distance to tank is 800 m
- B) Distance to 6' man is 600 m
- C) Distance to 6' man is 200 m

Reference: TM 11-5855-211-10



BLACK LINE RETICLE PATTERN

Through experience and test firing (zeroing), it has been determined that the placement of the reticle index marks produce the above noted range zeroing reference points.

Using these aiming points in the center of mass of a target will enable the sniper to obtain a first round hit.

Reference: TC 23-14

NAVAL SPECIAL WARFARE

SCOUT/SNIPER SCHOOL

DATE _____

LITTON MODEL M-845 NIGHT VISION WEAPONS SIGHT

1. LESSON PURPOSE. In order the SEAL sniper to engage targets during hours of limited visibility, he must use a night vision device. This period of instruction will provide you with the knowledge necessary to mount, put into operation, zero, and maintain the M-845 night vision device.

2. OBJECTIVES:

a. Lesson Objective: To enable the student to mount, put into operation, and zero the M-845 night vision device as stated in class.

b. Training Objectives.

1. Mount the M-845.
2. Place the NVD into operation.
3. Zero the M-845 NVD.

GENERAL:

The Litton Model M-845 is a compact, lightweight, battery powered night vision weapons sight for small arms use in low light conditions.

The weapons sight is effective at both short and intermediate ranges in a variety of environments and conditions. Employing a state-of-the-art 18MM 2nd generation microchannel plate image intensifier tube (light amplifier), the M-845 affords small arms users a completely "passive" night sighting and aiming capability.

The Litton M-845 is specifically designed for use with small bore weapons, (7.62MM and 5.56MM calibers). The litton night vision weapons sight is the smallest and lightest device of its type currently used by Special Warfare.

The rifle sight is furnished with a waterproof, flip-up lense cover that incorporates a daylight filter. This feature permits zeroing of the weapon during the hours of daylight.

1. NORMAL COMPLIMENT.
 - a. Model M-845 night vision weapons sight.
 - b. Lens cap/daylight filter.

- c. Lens cleaning tissue.
- e. Instruction and maintenance manual.
- f. 2 type E-132 mercury batteries.
- g. Thermo-formed ABS plastic transit and storage case.
- h. Mounting kit with all tools and hardware for mounting the M-845.

2. CONTROLS AND ADJUSTMENTS.

- a. ON/OFF rotary switch.
- b. Diopter focus ring.
- c. Elevation adjustment knob.
- d. Windage adjustment knob.

3. SYSTEM.

- a. Magnification.....1.55 x

3. ELECTRICAL.

- a. Battery life.....Approx. 40 hours (70 degrees).
- b. Low battery indicator.....Red L.E.D.
- c. Battery type (one each).....Mercury - 2.8 VDC Type 132.
Lithium - 3.0 VDC Type 440S-BT.

4. MECHANICAL.

- a. Length.....9.7 in.
- b. Height.....3.2 in.
- c. Width.....2.6 in.
- d. Weight w/battery.....2.2 lbs.

NOTE:

- a. The litton M-845, at longer ranges (200 yards and beyond) the red dot will obscure a man size target.

PRELIMINARY DATA SHEET

4X Night Binocular, Model M975, M976

System Performance

Magnification: 4.2 x
Field of View: 8.5 degrees
Focus Range: 30 m to infinity
Limiting Resolution: 3.0 lp/mR

<u>*Detection Range (m)</u>	<u>Full Moon</u>		<u>Starlight/Overcast</u>	
	Gen II	Gen III	Gen II	Gen III
Man	1140	1500	380	640
Tank	2850	4000	950	1600

Objective Lens

Focal Length: 116 mm
T-Number: 2.0

<u>Image Intensifier</u>	<u>M975</u>	<u>M976</u>
Type:	Gen II plus, non-inverting	Gen III, non-inverting
Gain:	18,000 - 25,000	20,000 - 35,000
Resolution (min):	28 lp/mm	28 lp/mm

* Detection ranges are calculated from laboratory tests under controlled light levels. Actual field performance may vary depending on atmospheric conditions.

- b. The M-845 does not have the light gathering capabilities of the PVS-4 night vision device.
- c. The M-845 also does not have a range finding capability as compared to the PVS-4 night vision device.

5. MOUNTING PROCEDURES.

- a. Attach the adapter to the base of the M-845 using the #10-24 x .312 L. socket head cap screws.

NOTE.

The use of a thread locking compound such as 222 locktight is recommended.

- b. Place the adapter on the night sight into the groove in the carrying handle.
- c. Align the tapped hole in the adapter with the hole in the handle; then insert and tighten the level screw assembly.

6. ZEROING PROCEDURES.

- a. Place a target at 25 meters.
- b. Support the weapon in a stable firing position.
- c. Turn the scope on.
- d. Fire a few rounds to seat the night sight on the weapon, retightening if necessary.
- e. Place the red dot over the center mass of the target and fire a three round group.
- f. Adjust the elevation and windage gears as required. Each click on the elevation or windage will move the impact of the round 0.55 in at 25 meters.
- g. Repeat steps e and f until the center of the impact group is at the center of the target or until the weapon is shooting point of aim point of impact.
- h. Place a target at 100 meters and repeat steps e and f (at 100 meters when the weapon is zeroed at 25 meters, the point of aim point of impact will be 5 cm high).

NOTE:

Each click of the elevation and windage will move the bullet impact a greater distance at longer ranges. (1.2 inches/click per 100 meters).

Eyepiece Lens

Exit Pupil:	8 mm
Eye Relief Distance:	27 mm
Interpupillary Distance:	55 to 71 mm
Dioptr Range:	-6 to +2

Mechanical

Weight:	1.1 Kg with AA batteries
Length x Max Width:	240 mm x 130 mm

Power Source

	<u>Battery Type</u>	<u>Operational Life @ 20°C</u>
	2 x AA (1.5 VDC)	60 Hours
or	1 x BA-1567/u	30 Hours
or	1 x BA-5567/u	30 Hours

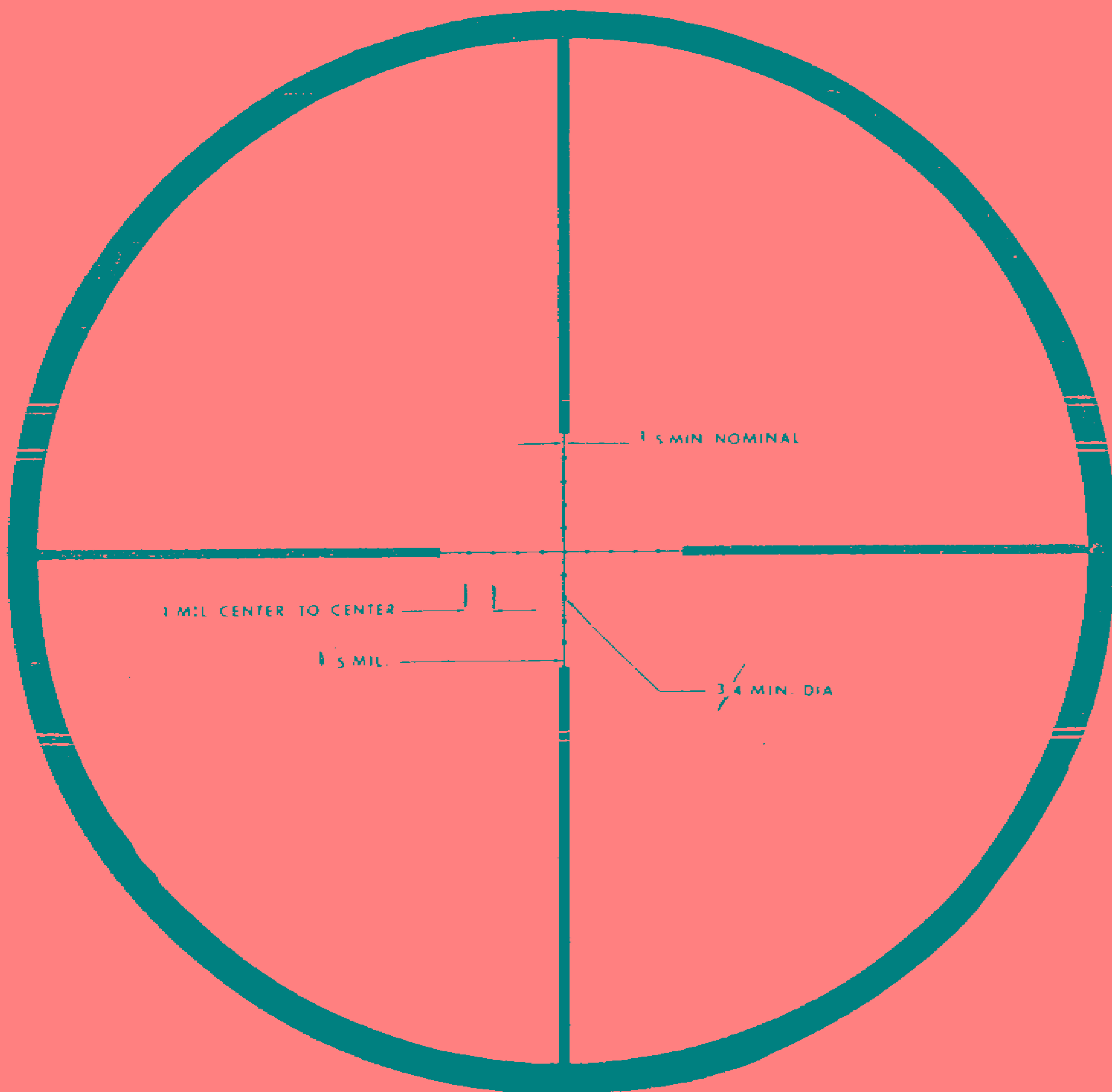
Other Features

- * Daylight Training Filter incorporated in objective lens cap
- * Fully interchangeable with M972, M973 Night Vision Goggle
- * Immersion tested 1 m water for ½ hour
- * NBC mask compatible

BELOW: LITTON M845 MK II ELECTRON DEVICE
RIGHT: LITTON M845 MK II AND ACCESSORIES
BOTTOM: LITTON M975 ELECTRON DEVICE



8. PARALLAX. Parallax is defined as the apparent movement of an object as seen from two different points not on line with the object. Observe a target at a range of 300 yards. While looking through the scope, move the head vertically and horizontally in small increments. The reticle should not appear to change position on the target. If it does, parallax is present and the objective lens must be focused.
9. PARALLAX. To focus the objective lens, adjust the side focus knob until the scope is free of parallax.
10. EYE RELIEF. When issued the telescope should be set all the way forward in the scope mounting rings. This setting will provide the needed 2 to 3 inch eye relief for almost all shooters. It is possible, however, to move the sight slightly to achieve proper eye relief by unlocking the keeper ring to the rear of the scope and adjusting the rear of the scope to the desired eye relief.
11. THE RETICLE. The duplex reticle in the telescope provides the sniper with a range-finding capability. To determine range, the following formula is used:
- $$\frac{\text{Height of target (in meters or yards)} \times 1000}{\text{Height of target (in mils)}} = \text{Range}$$
- The dots on the fine crosshairs are 1 mil apart with a total of 5 dots from the center to the thick post in each direction.
12. ELEVATION AND WINDAGE. The 10x M1 model has approximately 90 minutes of elevation adjustments, and 15 minutes of windage, it features friction type adjustments. For example, almost twice as much needed for the 7.62 mm 173 gr. national match cartridge to reach 1000 yards. The adjustments have 1/4 minutes clicks with both audible and tactical feedback.



3/4 Min. Mil Dot Reticle
Fig. #3

8x Actual Size

The Mil Dot Reticle is a duplex style reticle having thick outer sections and thin center sections. Superimposed on the thin center section of the reticles is a series of dots, (4 each side of the center and 4 above and below the center) that are spaced 1 milliradian apart, and 1 milliradian from both the center and the start of the thick section of the reticle. This spacing allows the user to make very accurate estimates of target range, assuming there is an object of known size (estimate) in the field of view. For example, a human target could be assumed to be about 6' tall, which equals 1.83 meters, or at 500 meters, 3.65 dots high (nominally, about 3.5 dots high). Another example would be a 1 meter target at 1000 meters range would be the height between two dots or the width between two dots. Basically, given a good estimation of the objects size, it is possible to fairly accurately determine the target range using the mil dot system.

NAVAL SPECIAL WARFARE

SCOUT SNIPER SCHOOL

DATE _____

OBSERVATION AIDS

The sniper's success is detecting targets, or the signs of enemy presence, is dependent on his powers of observation. To increase his ability to observe well, he is aided by the use of the telescope, binoculars, and starlight scope.

1. OBSERVATION SCOPE. The observation telescope is a prismatic optical instrument of 20-power magnification. The lenses are coated with magnesium flouride for high light gathering capability. The scope should be carried by the sniper team when it is justified by their mission. The high magnification of the telescope makes observation and target detection possible when conditions would otherwise prevent it. Camouflaged targets and those in deep shadows can be located, troop movements can be distinguished at great distances, and selected targets can be identified.

2. OPERATION. An eyepiece cap cover cap and objective lens cover are used to protect the optics when the telescope is not in use. Care must be taken to prevent cross-threading of the fine threads.

3. FOCUS. The eyepiece focusing sleeve is turned clockwise or counterclockwise until the image can be clearly seen by the operator. On other models the focus is adjusted by the focus knob at the bottom of the telescope.

4. TRIPOD. The height adjusting collar is a desired height for the telescope. The collar is held in position by tightening the clamping screw.

The shaft rotation locking thumb screw clamps the tripod shaft at any desired azimuth.

The elevating thumbscrew is used to adjust the of the tripod, to increase, or decrease the angle of elevation of the telescope.

The tripod legs can be held in an adjusted position by tightening the screw nut at the upper end of each leg.

4. SETTING UP THE SCOPE AND TRIPOD. Spread the legs and place the tripod on a level position on the ground.

Attach the scope to the tripod by screwing the attachment screw on the tripod, clockwise until tight. To take the scope off the tripod, unscrew the attachment screw counterclockwise.

1. BINOCULARS. Each sniper team will be equipped with binoculars to aid in observing the enemy and in searching for and selecting targets. The focusing adjustments are on each eyepiece. The left monocle has a mil scale etched into it.

2. METHODS OF HOLDING THE BINOCULARS. The binoculars should be held lightly resting on and supported by the heels of the hands. The thumbs block out light that would enter between the eye and the eyepiece. The eyepieces are held lightly to the eye to avoid transmitting body movement. Whenever possible, a stationary rest should support the elbows.

An alternate method for holding the binoculars is to move the hands forward, cupping them around the sides of the objective lenses. This keeps light from reflecting off the lenses, which would reveal the sniper's position.

3. ADJUSTMENTS. The interpupillary distance is the distance between the eyes. The monocles are hinged together so that they can be adjusted to meet this distance. The hinge is adjusted until the field of vision ceases to be two overlapping circles and appears as single, sharply defined circle. The setting of the hinge scale should be recorded for future use.

Each individual and each eye of that individual requires different focus settings. Adjust the focus for each eye in the following manner:

- a. With both eyes open, look through the glasses at a distance object.
- b. Place one hand over the objective lens of the right monocle and turn the focusing ring of the left monocle until the object is sharply defined.
- c. Uncover the right monocle and cover the left one.
- d. Rotate the focusing ring of the right monocle until the object is sharply defined.
- e. Uncover the left monocle. The object should then be clear to both eyes.
- f. Read the diopter scale on each focusing ring and record for future reference.

(1) RETICLE. The mil scale that is etched into the left lens of the binoculars is called the reticle pattern and is used in adjusting artillery fire and determining range to a target.

(2) Determining range with the binos is done similar to the telescope sight reticle. The height of the target is measured in mils. This is then divided into the height of the target in yards (or meters), times 1000, to give the range to the target in yards (or meters). Care should be taken to measure the target to the nearest 1/4 yard.

1. **ADDITIONAL USES FOR BINOCULARS.** In addition to observing and adjusting fire and range estimation, binoculars may be used to:

- a. Identify troops, equipment, vehicles, etc.
- b. Observe enemy movement or positions
- c. Make visual reconnaissance
- d. Locate targets
- e. Study terrain
- f. Select routes and positions
- g. Improve night vision
- h. Improve vision in periods of reduced vision.

2. **EYE FATIGUE.** Prolonged use of the binoculars or telescope will cause eye fatigue, reducing the effectiveness of observation. Periods of observation with optical devices should be limited to 30 minutes by a minimum of 15 minutes of rest.

AMMUNITION

Match quality ammunition will normally be issued because of its greater accuracy and reduced sensity to the wind. However, if match ammunition is not available, or the siduation dictates grade of ammunition may have to be used. In ammunition other than match, accuracy and point of aim point of impact may vary noticeably. Among different lots, an espectral accurate lot can be identified through use, and it should be used as long as it is available.

1. DATA MATCH AMMUNITION M118.

173-grain boattail bullet

Velocity.....2,550 feet per second.

Accuracy Specification.....3.5 feet mean radius at 600 yards. (1 minute of angle).

Caliber.....Match is stamped on the head, along with the year of production and the intitials of the arsenal which produced it(e.g. L.C. ID.Lake city).

2. DATA BALL AMMUNITION M80.

147 grain bullet

Velocity.....2,750 feet per second.

Caliber.....7.62mm M80 and M80E1.

Identifiers.....The year of production and the arsenal's initials are stamped on the head.

NOTE: M80E1 is the most accurate of the ball ammunition.

Because MATCH ammunition is heavier and slower than the other types, it is safe to assume that all other types of ammunition will strike higher on the target.

LAKE CITY M118 MATCH GRADE AMMUNITION WILL BE ISSUED TO THE SNIPER AND SHOULD BE FIRED AT ALL TIMES, WHEN AVAILABLE.

TECHNIQUES OF OBSERVATION

INTRODUCTION

1. Gain Attention. The Special Warfare sniper's mission requires him to support combat operations by delivering precision fire from concealed positions to selected targets. The term "selected targets" correctly implies that the sniper is more concerned with the significance of his targets than with the number of them. In his process of observation, he will not shoot the first one available, but will index the location and identification of all the targets he can observe.

2. The sniper is expected to perform several missions other than sniping. One of the more important is observation of the enemy and his activities.

3. Purpose

a. Purpose. The purpose of this period of instruction is to provide student with the knowledge, procedures and techniques applicable to both day and night time observation.

b. Main Ideas. The main ideas which will be discussed are the following:

- (1) Observation Capabilities and Limitations
- (2) Observation Procedures

4. Training Objectives. At the conclusion of this period of instruction, the student, without the aid of references, will be able to:

a. Describe the limitations of observation and the steps to be taken to overcome those limitations.

b. Describe the use of the telescope, 10X Ultra, and the starlight scope as an observation aid.

c. Describe the procedures used to observe and maintain observation of a specific area or target.

TRANSITION. Observation is the keynote to a sniper's success. He must be fully aware of the human capabilities and limitations for productive observation in waning light and in darkness and of his aids, which can enhance his visual powers under those conditions.

BODY

1. Capabilities and Limitations.

a. Night Vision. Night runs the gamut from absolute, darkness to bright moonlight. No matter how bright the night may appear to be, however, it will never permit the human eye to function with daylight precision. For maximum effectiveness, the sniper must apply the proven principles of night vision.

(1) Darkness Adaptation. It takes the eye about 30 minutes to regulate itself to a marked lowering of illumination. During that time, the pupils are expanding and the eyes are not reliable. In instances when the sniper is to depart on a mission during darkness, it is recommended that he wear red glasses while in light areas prior to his departure.

(2) Off-Center vs. Direct Vision. (TA #1) Off-center vision is the technique of focusing attention on an object without looking directly at it. An object under direct gaze in dim light will blur and appear to change shape, fade, and reappear in still another form. If the eyes are focused at different points around the object and about 6 to 10 degrees away from it, side vision will provide a true picture of the object.

(3) Scanning. Scanning is the act of moving the eyes in short, abrupt, irregular changes of focus around the object of interest. The eye must stop momentarily at each point, of course, since it cannot see while moving.

(4) Factors Affecting Night Vision

(a) Lack of vitamin A impairs night vision. However, overdoses of vitamin A will not improve night vision.

(b) colds, headache, fatigue, narcotics, heavy smoking, and alcohol excess all reduce night vision.

(c) Exposure to a bright light impairs night vision and necessitates a readaptation to darkness.

(d) Darkness blots out detail. The sniper must learn to recognize objects and persons from outline alone.

b. Twilight. During dawn and dusk, the constantly changing natural light level causes an equally constant process of eye adjustment. During these periods, the sniper must be especially alert to the treachery of half light and shadow. Twilight induces a false sense of security, and the sniper must be doubly careful for his own safety. For the same reason, the enemy is prone to carelessness and will frequently expose himself to the watchful sniper. The crosshairs of the telescopic sight are visible from about one-half hour prior to sunrise until about one-half hour after sunset.

c. Illumination Aids. On occasion, the sniper may have the assistance of artificial illumination for observation and firing.

EXAMPLES:

(1) Cartridge, Illuminating, M301A2. Fixed from an 81mm mortar, this shell produces 50,000 candlepower of light which is sufficient for use of the binoculars, the spotting scope, or the rifle telescopic sight.

(2) Searchlights. In an area illuminated by searchlight, the sniper can use any of the above equipment with excellent advantage.

(3) Other. Enemy campfires or lighted areas and buildings are other aids to the observing sniper.

d. Observation Aids.

(1) Binoculars. (TA #2) Of the night observation aids, binoculars are the simplest and fastest to use. They are easily manipulated and the scope of coverage is limited only by the sniper's scanning ability. Each sniper team will be equipped with binoculars to aid in observing the enemy and in searching for and selecting targets. The binocular, M17^{A1}, 7 x 50, has seven power magnification and a 50mm objective lens. Focal adjustments are on the eyepiece with separate adjustments for each eye. The left monocle has a horizontal and vertical scale pattern graduated in mils that is visible when the binoculars are in use.

(a) Method of Holding. Binoculars should be held lightly, monocles resting on and supported by the heels of the hands. The thumbs block out light that would enter between the eye and the eyepiece. The eyepieces are held lightly to the eye to avoid transmission of body movement. Whenever possible, a stationary rest should support the elbows.

(b) Adjustments

(1) Interpupillary Adjustment. The interpupillary distance (distance between the eyes) varies with individuals. The two monocles that make up a pair of field glasses are hinged together so that the receptive lenses can be centered over the pupils of the eyes. Most binoculars have a scale on the hinge, allowing the sniper to preset the glasses for interpupillary distance. To determine this setting, the hinge is adjusted until the field of vision ceases to be two overlapping circles and appears as a single sharply defined circle.

(2) Focal Adjustment. Each individual and each eye of that individual requires different focus settings. Adjust the focus for each eye in the following manner:

(a) With both eyes open, look through the glasses at a distant object.

(b) Place one hand over the objective lens of the right monocle and turn the focusing ring to the left monocle until the object is sharply defined.

(c) Uncover the right monocle and cover the left one.

(d) Rotate the focusing ring of the right monocle until the object is sharply defined.

(e) Uncover the left monocle; the object should then be clear to both eyes.

(f) Read the diopter scale on each focusing ring and record for future reference.

(c) Reticle. The mil scale that is etched into the left lens of the binoculars is the reticle pattern and is used in adjusting artillery fire and measuring vertical distance in mils. The horizontal scale is divided into 10-mil increments. The zero line is the short vertical line that projects below the horizontal scale between two numbers "1". To measure the angle between two objects (such as a target and an artillery burst), center the target above the zero line. Then read the number which appears on the scale under the artillery burst. There are two sets of mil scales, one above the zero on the horizontal scale, the other above the left horizontal 50-mil line on the horizontal scale. The vertical scales are divided into increments of 5 mils each. The vertical angle between the house and point A at the base of the tree is 10 mils. The third vertical scale is the range scale. It is used to estimate ranges from a known range but is not used by the sniper since he estimates his ranges by eye.

(2) Rifle Telescopic Sight, 10X Ultra. When equipped with the telescopic sight, the sniper can observe up to 800 meters with varying effectiveness in artificial illumination. In full moonlight, it is effective up to 600 meters. For best results, a supported position should be used.

(a) 10 Power. At 10 power, the field of view is more reduced and scanning clarity is impaired. High power can be used to distinguish specific objects, but scanning will lend a flat, unfocused appearance to terrain.

(3) Starlight Scope. Although the function of the starlight scope is to provide an efficient viewing capability during the conduct of night combat operations, the starlight scope does not give the width, depth, or clarity of daylight vision. However, the individual can see well enough at night to aim and fire his weapon, to observe effect of firing, the terrain, the enemy, and his own forces; and to perform numerous other tasks that confront Seal's in night combat. The starlight scope may be used by snipers to:

(a) Assist sniper teams in deployment under cover of darkness to preselected positions.

(b) Assist sniper teams to move undetected to alternate positions.

(c) Locate and suppress hostile fire.

(d) Limit or deny the enemy movement at night.

(e) Counter enemy sniper fire.

a. Factors Affecting Employment. Consideration of the factors affecting employment and proper use of the starlight scope will permit more effective execution of night operations. The degree to which these factors aid or limit the operational capabilities of the starlight scope will vary depending on the light level, weather conditions, operator eye fatigue, and terrain over which the starlight scope is being employed.

(1) Light. Since the starlight scope is designed to function using the ambient light of the night sky, the most effective operation can be expected under conditions of bright moonlight and starlight. As the ambient light level decreases, the viewing capabilities of the starlight scope diminish. When the sky is overcast and the ambient light level is low, the viewing capabilities of the starlight scope can be greatly increased by the use of flares, illuminating shells or searchlight.

(2) Weather Conditions. Clear nights provide the most favorable operating conditions in that sleet, snow, smoke, or fog affect the viewing capabilities of the starlight scope. Even so, the starlight scope can be expected to provide some degree of viewing capability in adverse weather conditions.

(3) Terrain. Different terrain will have an adverse effect on the starlight scope due to the varying ambient light conditions which exist. It will be the sniper's responsibility to evaluate these conditions and know how each will affect his ability to observe and shoot.

(4) Eye Fatigue. Most operators will initially experience eye fatigue after five or ten minutes of continuous observation through the starlight scope. To aid in maintaining a continued viewing capability and lessen eye fatigue, the operator may alternate eyes during the viewing period.

4. Observation Telescope. The observation telescope is a prismatic optical instrument of 20-power magnification. It is carried by the sniper teams whenever justified by the nature of a mission. The lens of the telescope are coated with a hard film of magnesium fluoride for maximum light transmission. This coating together with the high magnification of the telescope makes observation and target detection possible when conditions or situations would otherwise prevent positive target identification. Camouflaged targets and those in deep shadows can be distinguished, troop movements can be observed at great distances, and selective targets can be identified more readily.

a. Operation. The eyepiece cover cap and objective lens cover must be unscrewed and removed from the telescope before it can be used. The cap and cover protect the optics when the telescope is not in use. The eyepiece focusing sleeve is turned clockwise or counterclockwise until the image can be carefully seen by the operator. CAUTION: Care must be taken to prevent cross-threading of the fine threads.

(2) Observation Procedures. The sniper, having settled into the best obtainable position, is ready to search his chosen area. The process of observation is planned and systematic. His first consideration is towards the discovery of any immediate danger to himself, so he begins with a "hasty search" of the entire area. This is followed by a slow, deliberate

observation which he calls a "detailed search". Then, as long as he remains in position, the sniper maintains a constant observation of the area using the hasty and detailed search methods as the occasion requires.

(a) Hasty Search. This is a very rapid check for enemy activity conducted by both the sniper and the observer. The observer makes the search with the 7 x 50 binoculars, making quick glances at specific points throughout the area, not by a sweep of the terrain in one continuous panoramic view. The 7 x 50 binoculars are used in this type search because they afford the observer with the wide field of view necessary to cover a large area in a short time. The hasty search is effective because the eyes are sensitive to any slight movements occurring within a wide arc of the object upon which they are focused. The sniper, when conducting his hasty search, uses this faculty called "side vision" or "seeing out of the corner of the eye". The eyes must be focused on a specific point in order to have this sensitivity.

(b) Detailed Search.

(1) If the sniper and his partner fail to locate the enemy during the hasty search, they must then begin a systematic examination known as the 50-meter overlapping strip method of search. Again the observer conducts this search with the 7 x 50 binoculars, affording him the widest view available. Normally, the area nearest the sniper offers the greatest potential danger to him. Therefore, the search should begin with the terrain nearest the observer's location. Beginning at either flank, the observer should systematically search the terrain to his front in a 180-degree arc, 50 meters in depth. After reaching the opposite flank, the observer should search the next area nearest his position. This search should cover the terrain includes about ten meters of the area examined during the first search. This technique ensures complete coverage of the area. Only when a target appears does the observer use the observation scope to get a more detailed and precise description of the target. The observation scope should not be used to conduct either the hasty or detailed search as it limits the observer with such a small field of view. The observer continues searching from one flank to the other in 50-meter overlapping strips as far out as he can see.

(2) To again take advantage of his side vision, the observer should focus his eyes on specific points as he searches from one flank to the other. He should make mental notes of prominent terrain features and areas that may offer cover and/or concealment to the enemy. In this way, he becomes familiar with the terrain as he searches it.

(c) Maintaining Observation

(1) Method. After completing his detailed search, the sniper may be required to maintain observation of the area. To do this, he should use a method similar to his hasty search of the area. That is, he uses quick glances at various points throughout the entire area, focusing his eyes on specific features.

(2) Sequence. In maintaining observation of the area, he should devise a set sequence of searching to ensure coverage of all terrain.

Since it is entirely possible that this hasty search may fail to detect the initial movement of an enemy, the observer should periodically repeat a detailed search. A detailed search should also be conducted any time the attention of the observer is distracted.

OPPORTUNITY FOR QUESTIONS

SUMMARY

1. Reemphasize. During this period of instruction, we have discussed the capabilities and limitations of observation during the hours of both daylight and dark. The different techniques and aids of improving your vision were discussed.

We covered the night observation aids that are available to the sniper. It was noted that the binoculars are the simplest and fastest to use. The starlight scope was discussed in detail as to its employment and those factors affecting its employment.

In conclusion, details of observation procedures were covered. The "Hasty Search" is understood to be the first search conducted by the sniper once he moves into position as this search is conducted to discover any immediate danger to him.

2. Remotivate. Your ability to become proficient in the techniques mentioned will allow you to see the enemy before he sees you and get that first round off.

OBSERVATION LOG

Sheet _____ of _____

Originator _____ Date _____ Tour of Duty _____

Position _____ Visibility _____

Serial	Time	Grid Coordinate GR / Brg and Range	Event	Action or Remarks

RANGE CARD, LOG BOOK AND FIELD SKETCHING

DETAILED OUTLINE

INTRODUCTION

1. Gain Attention. The primary mission of Seal sniper is to deliver precision fire on selected targets from concealed positions. His secondary mission is to collect information about the enemy. To do this, he must primarily be observant, first to locate prospective targets and second to be able to identify what he sees. However observant he may be, the sniper cannot be expected to exercise the sheer feat of memory necessary to remember the ranges to all possible targets within his area of observation, or to recall all tidbits of information he may come across. The means designed to assist him in this task are the range card, the log book and the field sketch.

2. Today you are going to learn how to record the data which you will need to accomplish both your primary and your secondary mission, thereby greatly enhancing your chance of achieving a first round hit and of collecting useful and useable raw intelligence.

3. Purpose.

a. Purpose. To introduce you to the range card, log book and field sketch as used by the sniper in recording range estimates and in collecting information about the enemy.

b. Main Ideas. To describe the preparation of range cards and their relationship to field sketches, and to teach how to draw adequate field sketches. Also to teach the components of various tactical reports for inclusion in the sniper log book.

4. Training Objectives. Upon completion of this period of instruction, the student will be able to:

- a. Prepare a Range Card
- b. Prepare a Log Book
- c. Prepare a Field Sketch

BODY

1. The range card is a handy reference which the sniper uses to make rapid, accurate estimates of range to targets which he may locate in the course of his observations.

a. (Show slide #1, Field Expedient Range Card) This slide illustrates a range card which a sniper might have prepared after his arrival at a point of observation. The card is drawn freehand and contains the following information:

- (1) Relative locations of dominating objects and terrain features.
- (2) Carefully estimated, or map measured, ranges to the objects or features.
- (3) The sniper's sight setting and holds for each range.

b. (Show slide # 2, Prepared Range Card) Prior to departure on a mission, the sniper can prepare a better range card, shown here. Upon arrival in position, he draws in terrain features and dominant objects. To avoid preparing several cards for use in successive positions, the sniper can cover a single card with acetate and use a grease pencil to draw in the area features. Copies of the prepared range card should be prepared and used whenever possible.

c. Use of the Range Card

(1) Holding. (Show slide # 2, Prepared Range Card) The sniper locates a target in the doorway of the house at 10 o'clock from his position. From his card, he quickly determines a range of 450 yards and holds at crotch level. He centers the crosshairs on the crotch, fires, and hits the target in the center of the chest.

(2) Sight Setting. The sniper locates a target on the roof of the house at one o'clock from his position. He notes the sight setting 61, applies that sight setting, and fires.

2. The Field Sketch.

a. The field sketch is a drawn reproduction of a view obtained from any given point, and it is vital to the value of a sniper's log and range card, that he be able to produce such a sketch. As is the case for all drawings, artistic ability is an asset, but satisfactory sketches can be produced by anyone, regardless of artistic skill. Practice is, however, essential and the following principles must be observed:

(1) Work from the whole to the part. Study the ground first carefully both by eye and with binoculars before attempting a drawing. Decide how much of the country is to be included in the sketch. Select the major features which will form the framework of the panorama.

(2) Do not attempt to put too much detail into the drawing. Minor features should be omitted, unless they are of tactical importance,

or are required to lead the eye to some adjacent feature of tactical importance. Only practice will show how much detail should be included and how much left out.

(3) Draw everything in perspective as far as possible.

b. Perspective. The general principles of perspective are:

(1) The farther away an object is in nature, the smaller it should appear in the drawing.

(2) Parallel lines receding from the observer appear to converge; if prolonged, they will meet in a point called the "vanishing point." The vanishing point may always be assumed to be on the same plane as the parallel lines. Thus, railway lines on a perfectly horizontal, or flat, surface, receding from the observer will appear to meet at a point on the horizon. If the plane on which the railway lines lie is tilted either up or down, the vanishing point appears to be similarly raised or lowered. (Slide # 3) Thus, the edges of a road running uphill and away from the observer will appear to converge on a vanishing point above the horizon, and if running downhill, the vanishing point will appear to be below the horizon. (Slide #4)

c. Conventional Shapes. Roads and all natural objects, such as trees and hedges, should be shown by conventional outline, except where peculiarities of shape make them useful landmarks and suitable as reference points. This means that the tendency to draw actual shapes seen should be suppressed, and conventional shapes used, as they are easy to draw and convey the required impression. Buildings should normally be shown by conventional outline only, but actual shapes may be shown, when this is necessary to ensure recognition, or to emphasize a feature of a building which is of tactical importance. The filling in of outlines with shadowing, or hatching, should generally be avoided, but a light hatch may sometimes be used to distinguish wooded areas from fields. Lines must be firm and continuous.

d. Equipment. The sniper should have with him the following items:

(1) Suitable paper in a book with a stiff cover to give a reasonable drawing surface.

(2) A pencil, preferably a No. 2 pencil with eraser

(3) A knife or razor blade to sharpen the pencil

(4) A protractor or ruler, and

(5) A piece of string 15" long.

e. Extent of Country to be Included. A convenient method of making a decision as to the extent of the country to be drawn in a sketch is to hold a protractor about 11 inches from the eyes, close one eye, and consider the section of the country thus covered by the protractor to be the area sketched. The extent of this area may be increased or decreased by moving

the protractor nearer to, or farther away from, the eyes. Once the most satisfactory distance has been chosen, it must be kept constant by a piece of string attached to the protractor and held between the teeth.

f. Framework and Scale. The next step is to mark on the paper all outstanding points in the landscape in their correct relative positions. This is done by noting the horizontal distance of these points from the edge of the area to be drawn, and their vertical distance above the bottom line of this area, or below the horizon. If the horizontal length of the sketch is the same size as the horizontal length of the straight edge of the protractor, the horizontal distances in the picture may be gotten by lowering or raising the protractor and noting which graduations on its straight edge coincide with the feature to be plotted; the protractor can then be laid on the paper and the position of the feature marked against the graduation noted. The same can be done with vertical distances by turning the straight edge of the protractor to the vertical position.

g. Scale. The eye appears to exaggerate the vertical scale of what it sees, relative to the horizontal scale, i. e. things look taller than they are. It is preferable, therefore, in field sketching to use a larger scale for vertical distances than for horizontal, in order to preserve the aspect of things as they appear to the viewer. A suitable exaggeration of the vertical scale relative to the horizontal is 2:1, which means that every vertical measurement taken to fix the outstanding points are plotted as read.

h. Filling in the Detail. When all the important features have been plotted on the paper in their correct relative positions, the intermediate detail is added, either by eye, or by further measurement from these plotted points. In this way, the sketch will be built up upon a framework. All the original lines should be drawn in lightly. When the work is completed, it must be examined carefully and compared with the landscape, to make sure that no detail of military significance has been omitted. The work may now be drawn in more firmly with darker lines, bearing in mind that the pencil lines should become darker and firmer as they approach the foreground.

i. Conventional Representation of Features. The following methods of representing natural objects in a conventional manner should be borne in mind when making the sketch:

(1) Prominent Features. The actual shape of all prominent features which might readily be selected as reference points when describing targets, such as oddly shaped trees, outstanding building, towers, etc...should be shown if possible. They must be accentuated with an arrow and a line with a description, e. g. Prominent tree with large withered branch.

(2) Rivers. Two lines diminishing in width as they recede should be used.

(3) Trees. These should be represented by outline only. Some attempt should be made to show characteristic shape of individual trees in the foreground.

(4) Woods. Woods in the distance should be shown by outline only. In the foreground, the tops of individual trees may be indicated. Woods may be shaded, the depth of shadowing becomes less with distance.

(5) Roads. Roads should be shown by a double continuous line diminishing in width as it recedes.

(6) Railways. In the foreground, railways should be shown by a double line with small cross lines (which represent the ties) to distinguish them from roads; in the distance, they will be indicated by a single line with vertical ticks to represent the telegraph poles.

(7) Churches. Churches should be shown on outline only, but care should be taken to denote whether they have a tower or a spire.

(8) Towns and Villages. Definite rectangular shapes denote houses; towers, factory chimneys and prominent buildings should be indicated where they occur.

(9) Cuts and Fills. These may be shown by the usual topographic symbols, ticks diminishing in thickness from top to bottom, and with a firm line running along the top of the slope in the case of a cut.

(10) Swamps and Marshland. They may be shown by the conventional topographic symbols.

j. Other Methods of Field Sketching.

(1) The Grid Window. A simple device which can help a great deal in field sketching can be made by taking a piece of cardboard or hard plastic and cutting out of the center of it, a rectangle 6" x 2". A piece of clear plastic sheeting or celluloid is then pasted over the rectangle. A grid of squares of $\frac{1}{2}$ " size is drawn on the plastic sheeting. You now have a ruled plastic window through which the landscape can be viewed. The paper on which the drawing is to be made is ruled with a similar grid of squares. If the frame is held at a fixed distance from the eye by a piece of string held in the teeth, the detail seen can be transferred to the paper square by square.

(2) The Compass Method. Another method is to divide the paper into strips by drawing vertical lines denoting a fixed number of mils of arc and plotting the position of important features by taking compass bearings to them. This method is accurate but slow.

3. The Sniper Log Book. The sniper log is a factual, chronological record of his employment, which will be a permanent source of operational data. It will provide information to intelligence personnel, unit commanders, other snipers and the sniper himself. Highly developed powers of observation are essential to the sniper, as explained in earlier lessons. Because of this, he is an important source of intelligence whose reports may influence future operations, and upon which many lives may depend.

a. Data to be Recorded. The log will contain at a minimum, the following information:

- (1) Names of observers,
- (2) Hours of observation,
- (3) Data and Position (Grid Coordinates)
- (4) Visibility
- (5) Numbered observations in chronological order,
- (6) Time of observation,
- (7) Grid reference of observation,
- (8) Object seen, and
- (9) Remarks or action taken.

b. Supplementary Materials. The sniper log is always used in conjunction with the field sketch. In this way, not only does the sniper have a written account of what he saw, but also a pictorial reference showing exactly where he sighted or suspected enemy activity. If he is then relieved in place, the new observer can more easily locate earlier sightings, by comparing the field sketch to the landscape, than he could solely by use of grid coordinates.

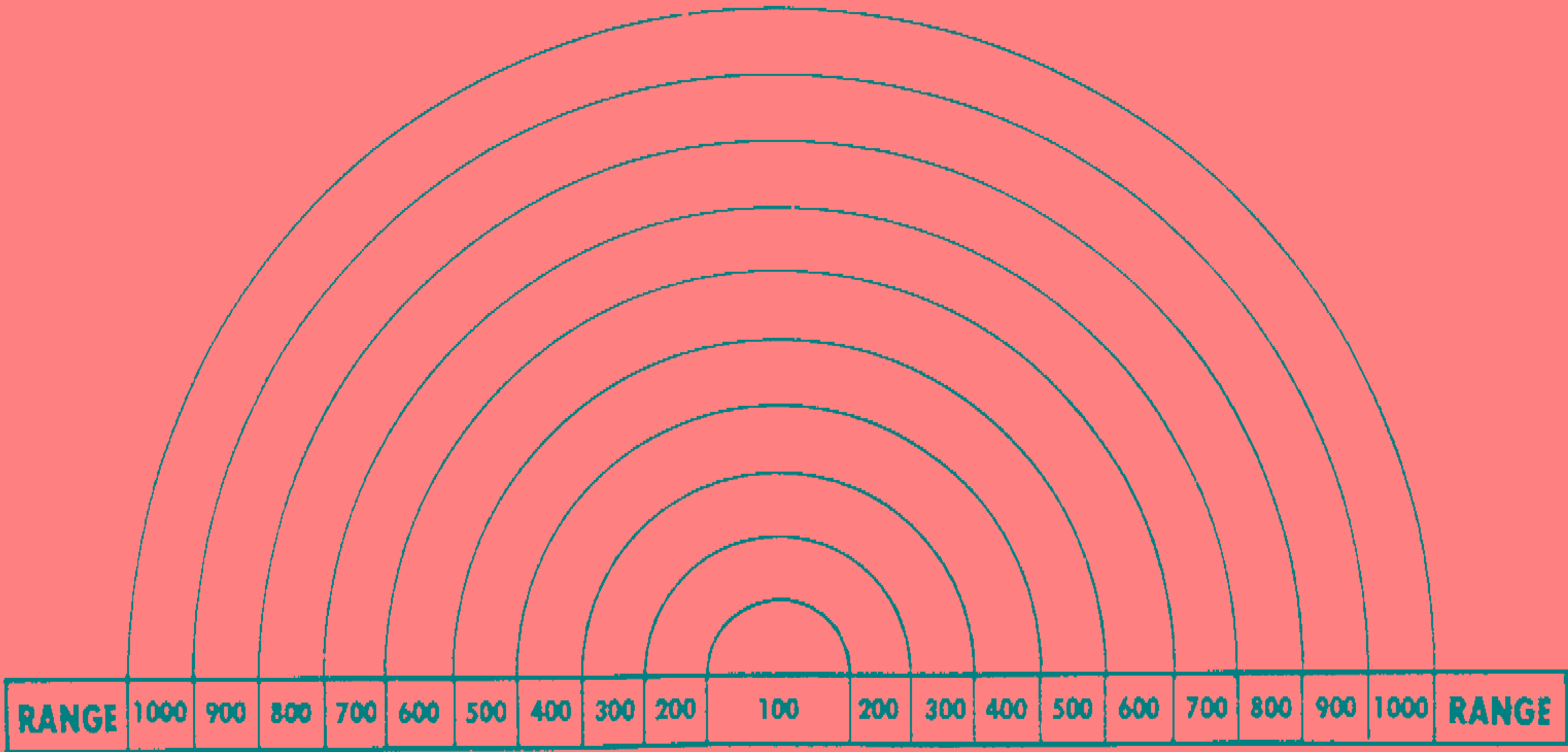
OPPORTUNITY FOR QUESTIONS AND COMMENTS

SUMMARY

1. Reemphasize. During this period of instruction, we have looked at the Range Card, The Field Sketch, and The Log Book. Each was presented as an entity in itself and as how each related to the other.

2. Remotivate. The primary and secondary missions of the sniper were mentioned at the beginning of this class. The primary mission can be fulfilled without use of a log book and the secondary mission can be accomplished without recourse to a range card. However, to be a complete Seal Scout/Sniper, you must be able to prepare a useable field sketch and range card to ensure accurate shooting and a thorough log book to collect all available intelligence data.

SNIPERS RANGE CARD



GRID COORDINATE OF POSITIONS _____

METHOD OF OBTAINING RANGE _____

MADE OUT BY _____

DATE _____

SIGHTING, AIMING AND TRIGGER CONTROL

INTRODUCTION

1. Gain Attention. The first of the basic marksmanship fundamentals taught to the shooter are sighting, aiming and trigger control. The reason for this is that without an understanding of the fundamentals, a sniper will not be able to accomplish his primary mission.

2. Motivate. During your eight weeks here at the school, you will be taught individual movement, cover and concealment, map reading and many other related sniper skills, in addition to marksmanship. By the time you graduate, you will be able to move to a sniper position, fire a shot and withdraw, all without being observed. However, all this will be to no avail if, because you do not understand the principles of sighting, aiming and trigger control, you miss your target when you do fire.

3. State Purpose and Main Ideas.

A. Purpose. To introduce the student to the principles of sighting, aiming and trigger control as applied to the sniper rifle with telescopic sight.

B. Main Ideas.

(1) Sighting and aiming will be discussed in three phases:

(a) The relationship between the eye and the sights

(b) Sight picture

(c) Breathing

(2) Trigger control will be explained through smooth action, interrupted pull, concentration and follow-through.

4. Training Objectives. Upon completion of this period of instruction, the student will be able to:

A. Understand and demonstrate the sighting error known as "shadow effect";

B. Understand and demonstrate "Quartering" the target.

C. Understand and demonstrate proper trigger control.

TRANSITION. The arrangement of an optical sight allows for aiming without recourse to organic rifle sights. The role of the front sight in a telescope is fulfilled by the crosshairs. Because of the crosshairs and the image of the target are in the focal plane of the lens, the shooter can use both at the same time and with equal clarity.

BODY

A. Aiming

(1) Relationship between the eye and the sights. In order to see what is required during aiming, the shooter must know how to use his eye. Variations in the positions of the eye to the telescope will cause variations in the image received by the eye. The placement of eye in this respect is called eye relief. Proper eye relief is approximately 2-3 inches from the exit pupil of the telescope, and can be determined to be correct when the shooter has a full field of view in the telescope with no shadows. If the sniper's eye is located without proper eye relief, a circular shadow will occur in the field of vision, reducing the field size, hindering observation, and, in general, making aiming difficult. If the eye is shifted to one side or another of the exit pupil, crescent shaped shadows will appear on the edges of the eyepiece (TP #1 Shadow Effects). If these crescent shaped shadows appear, the bullet will strike to the side away from the shadow. Therefore, when the sniper has a full field of view and is focusing on the intersection of the crosshairs, he has aligned his sight.

(2) Sight Picture. With the telescopic sight, this is achieved when the crosshairs are centered on the target, and the target has been quartered. (Place on TP #3, Sample Sight Pictures). This transparency shows samples of different types of sight pictures. In each case, you can see that the target has been quartered to maximize the chance of a first round hit.

(3) Breathing. The control of breathing is critical to the aiming process. If the sniper breathes while aiming, the rising and falling of his chest will cause the muzzle to move vertically. To breath properly during aiming, the sniper inhales, then exhales normally and stops at the moment of natural respiratory pause. The pause can be extended to 8-10 seconds, but it should never be extended until it feels uncomfortable. As the body begins to need air, the muscles will start a slight involuntary movement, and the eyes will loose their ability to focus critically. If the sniper has been holding his breath for more than 8-10 seconds, he should resume normal breathing and then start the aiming process over again.

B. Trigger Control

(1) The art of firing your rifle without disturbing the perfected aim is the most important fundamental of marksmanship. Not hitting where you aim is usually caused by the aim being disturbed just before or as the bullet leaves the barrel. This can be caused by jerking the trigger or flinching as the rifle fires. A shooter can correct these errors by using the correct technique of trigger control.

(2) Controlling the trigger is a mental process, while pulling the trigger is a physical one. Two methods of trigger control used with the sniper rifle are smooth action and interrupted pull.

(a) Using the smooth action method, the shooter takes up the initial pressure, or free play, in the trigger. Then, when the aim is perfected, increases the pressure smoothly until the rifle fires.

(b) When using the interrupted method of trigger pull, the shooter takes up the initial pressure and begins to squeeze off the shot when the aim is perfected. However, because of target movement or weapon movement, he pauses in his trigger squeeze until the movement stops, then continues to squeeze until the weapon fires.

(c) Trigger Control Developed as a Reflex. The shooter can develop his trigger control to the point that pulling the trigger no longer requires conscious effort. The shooter will be aware of the pull, but he will not consciously be directing it. A close analogy to trigger control can be found in typing. When first learning to type, the typist reads the alphabetic letter to be typed, mentally selects the corresponding key, and consciously directs a finger to strike the key. After training and practice, however, the typist will see the letter which has to be typed and the finger will hit it automatically. This then, is a conditioned reflex; conditioned because it was built in and reflex because it was not consciously directed.

The same type of conditioned reflex can be developed by the sniper. When he first starts firing, he must consciously direct his finger to squeeze the trigger as soon as the aim is perfected. As a result of training, however, a circuit will be established between the eye and the trigger finger. The eye, seeing the desired sight picture, will cause the finger to squeeze the trigger without conscious mental effort. The shooter, like the typist is aware of pressure against the trigger, but is not planning or consciously directing it.

(d) Developing Trigger Control. In all positions, one of the best methods for developing proper trigger control is through dry firing, for here the shooter is able to detect his own errors without having recoil conceal undesirable movements. Only through patience, hard work, concentration and great self-discipline will the mastery of trigger control be achieved.

(3) Factors Affecting Trigger Control.

(a) Concentration. The shooter's concentration should be focused on the perfection of aim, as trigger control is applied. Concentration defined as the will to demand obedience, is the most important factor in the technique of trigger control.

(b) Placement of the Trigger Finger and Grip on the Rifle. The finger should be placed on the trigger in the same place each time. Only through practice can the shooter determine which part of his finger should go on which spot on the trigger. Any position of the finger in relation to the trigger is acceptable so long as the shooter can pull the trigger straight to the rear.

Moreover, in order to achieve a smooth, consistent trigger squeeze, the stock must be grasped firmly and in the same place each time.

(c) Follow-Through. Follow-through means doing the same things after each shot is fired, thereby insuring that there is no undue movement of the rifle before the bullet leaves the barrel. The shooter continues to hold his breath, to focus on the crosshairs and to practice trigger control even though the rifle has already fired. By doing this, the shooter can detect any errors in sight alignment and sight picture and he can correct them after follow-through has been completed.

OPPORTUNITY FOR QUESTIONS AND COMMENTS

(1 MIN)

SUMMARY

(1 MIN)

1. Reemphasize. We have just covered the marksmanship fundamentals of sighting, aiming and trigger control, and how to apply them properly.

2. Remotivate. Your ability to hit a target at any range and under any conditions will be a measure of how well you have practiced and mastered these principles.

CORRECTING FOR ENVIRONMENTAL FACTORS

1. **PURPOSE.** In the case of the highly trained sniper, effects of the weather are a primary cause of error in the strike of the bullet. The wind, mirage, light, temperature, and humidity all have effects on the bullet, the sniper, or both. Some effects are insignificant depending on the average conditions of sniper employment. However, sniping is accomplished under extreme of weather and therefore all effects must be considered. The observation telescope will not only assist you in detecting well camouflaged targets, it may also be used to read mirage. This two hour conference will provide you with the necessary information to compensate for the effects of wind and weather and to properly use the observation telescope.

2. OBJECTIVES:

a. Training Objective. To enable the sniper to explain the effects of wind and weather on the strike of the bullet and how to compensate for these effects and use the observation telescope in accordance with TC 23-14.

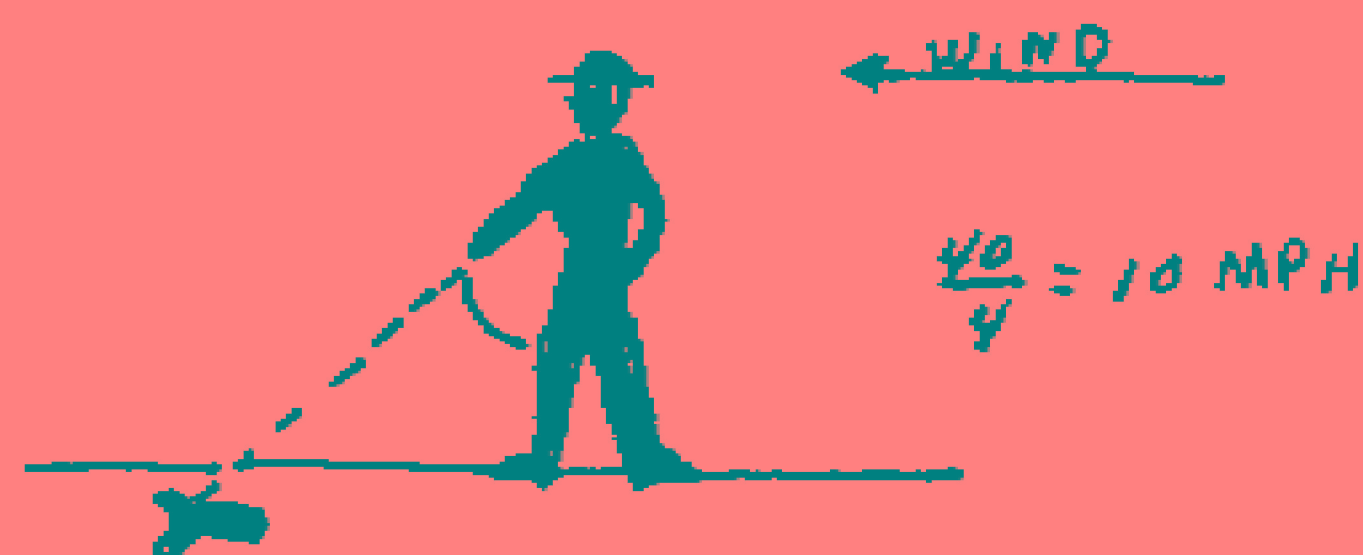
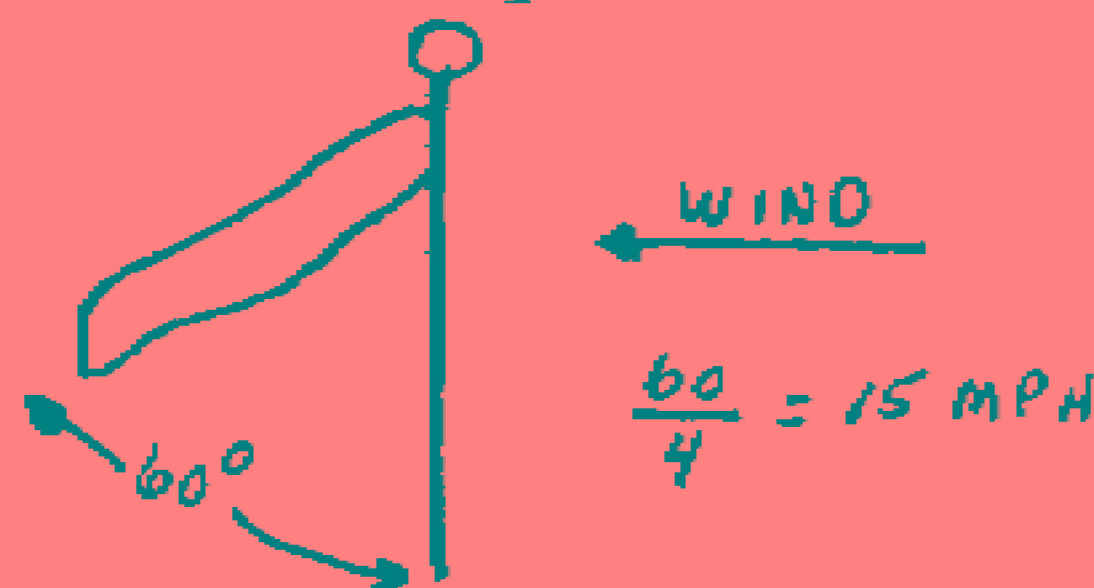
b. Training Objective. As a student in a field environment, accomplish the following training objectives in accordance with TC 23-14 and as discussed in class:

- (1) Explain the effects of wind.
- (2) Explain the effects of mirage.
- (3) Explain the effects of temperature.
- (4) Explain the effects of light.
- (5) Explain the effects of humidity and altitude.
- (6) Use the observer's telescope.

The objective of this lesson was to enable you to explain the effects of wind and weather on the strike of the bullet and how to compensate for these effects, and to use the observation telescope in accordance with TC 23-14.

a. The conditions which constantly present the greatest problem to the sniper is the wind. The flag, drop field expedient, or clock themth may be used to estimate wind velocity. However, the most accurate method of determining wind velocity is by eading mirage.

b. To determine wind velocity using the flag (or drop) method, divide the angle the range flag (or light object dropped from the shoulder) makes from the verticle by a constant of 4.



c. To determine the number of clicks necessary to compensate from the wind, using either iron sight or scope, the following formulas are used:

(1) For M118 NM ammunition use:

$$\frac{RxV}{10} = \text{Number of clicks for a full value wind}$$

(2) For M80 ball ammunition use:

$$\frac{RxV}{15} = \text{Minutes of angle for a full value wind}$$

NOTE: For rantes less than or equal to 500 yards; beyond 500 yards constant 15 changes to bullet velocity loss.

<u>RANGE</u>	<u>CONSTANT</u>
600	14
700	13
800	13
900	12
1,000	11

d. Using M80 ball ammunition, the answer in minutes of angle must be multiplied times 2 to determine clicks.

e. For a half value wind, divide clicks by 2.

f. To determine the amount of "hold-off" needed to compensate for the wind the following formula is used.

$$\frac{CxR}{2} = \text{Inches of hold-off}$$

C: Is the number of clicks.

R: Is the range to the target in nearest hundreds(i.e., 500 yards, converts to 5).

V: Is the wind velocity in MPH.

g. Field expedient method:

<u>WIND</u>	<u>EFFECTS</u>
01-03	Direction of wind shown by smoke but not by flag.
04-07	Wind felt on face, leaves rustle.
08-12	Leaves and small twigs in constant motion.
13-18	Raises dust and loose paper; small branches are moved.
19-24	Small tree in leaf being to sway.

h. There are three types of mirage:

<u>SLOW</u>	<u>FAST</u>	<u>BOILING</u>
0-7 MPH	8-15 MPH	No value

Mirage also has density, in addition to direction:

<u>THICK</u>	<u>THIN</u>
High Temperature, High Humidity, Bright Light	Low Temperature and/or Low Light

i. To read mirage, the sniper/observer focuses his spotting scope at mid-range.

(1) At 300 yards, a +20 degree change in temperature necessitates a +1 minute of angle change. *

(2) At 600 yards, a +15 degree change in temperature necessitates a +1 minute of angle change. *

(3) At 1,000 meters, a 10 degree change in temperature necessitates a +1 minute of angle change. *

*NOTE: Remember that 1 minute of angle = 2 clicks.

j. The rule of thumb for temperature correction is temperature up, sights down and temperature down, sights up.

k. The rule of thumb for humidity is humidity up, sights up and humidity down, sights down.

l. The rule of thumb for changes in light conditions is lights up, sights up and light down, sights down.

m. Elevation above sea level can have an important effect on bullet trajectories. At higher elevations, both air density and temperature decreases, and air drag on the bullet decreases. At higher elevations, the sniper has a tendency to shoot high.

n. The observer's telescope not only aids the sniper in detecting targets, it is also a valuable tool in reading mirage. The observer telescope, when reading mirage, is focused at mid-range.

APPLICATION OF FIRE

1. **PURPOSE:** Under normal conditions, all sniping occurs over unknown distances. Without a thorough grounding in the practical application of exterior ballistics, it is unlikely that a sniper will be capable of hitting his targets at any point but the shortest ranges. This lesson concerns itself with the fundamentals of unknown distance shooting and the application of exterior ballistics.

2. OBJECTIVES:

a. Objective. To enable the sniper to apply the fundamentals of exterior ballistics in the engagement of targets at unknown distances to include; definition and application of minute of angle corrections, minute of angle conversions, indication of targets and fire control orders, and practical application of exterior ballistics for firing over ground and computing hit probability.

b. Training Objectives. As a sniper demonstrate the application of the following training objectives in accordance with FMFM 1-3B and TC 23-14.

- (1) Calculate minute of angle corrections and conversions.
- (2) Define the components and the factors which influence a bullet's trajectory.
- (3) Demonstrate the indication of targets at unknown distances.

APPLICATION OF FIRE

1. A minute of angle (MOA) is an angular measure which subtends 1/60th of one degree of arc; and for practical purposes is the equivalent of one (1) inch per 100 yards of range, ie, 1 MOA = 3 inches at 300 yards, or 3 cm per 100 meters of range, ie, 5 MOA = 75 cm at 500 meters.
2. To determine minutes of correction, divide the error in inches or centimeters by the whole number of the range in hundreds of yards or meters.

$$\text{MINUTES} = \frac{\text{ERROR}}{\text{RANGE}}$$

3. To convert mils to minutes of angle, multiply minutes mils by 3.375.

$$1 \text{ Mil} = 3.375 \text{ Minutes}$$

4. Trajectory is the path a bullet follows when fired from a weapon.
5. The factors which influence trajectory are:
 - a. The initial (muzzle) velocity.
 - b. The angle of departure.
 - c. Air resistance.
 - d. The rotation of the projectile about its axis.
 - e. Gravity.
6. Angle of departure is the elevation in minutes or degrees that must be imparted to the barrel through sight corrections, in order that the bullet will strike a target at a specific distance.
7. Angle of departure, and therefore point of impact, is not constant and is affected by four (4) variables:
 - a. Variations in initial velocity due to imperfections of ammunition.
 - b. Imperfections in aiming.
 - c. Imperfections in the rifle.
 - d. Errors in holding and canting the rifle.

8. Air resistance is the most significant factor in trajectory.
9. Maximum ordinate is the highest point of the trajectory. It divides the trajectory into the rising branch and the falling branch.
10. Point of aim is the point where the line of sight meets the target.
11. Point of impact is the point where the bullet strikes the target.
12. There are two (2) danger spaces:
 - a. The distance in front of the muzzle, within which the bullet does not rise higher than the object fired at, is called the danger space of the rising branch.
 - b. The distance beyond the maximum ordinate, within which the bullet drops from the height of the target to below target level, is the danger space of the falling branch. This is divided into the danger space in front of the target, and danger space behind the target, with the height of the point of aim as the dividing point.
13. The extent of the danger space is dependent upon:
 - a. Height of the firer.
 - b. Height of the target.
 - c. The flawlessness of the trajectory.
 - d. The angle of the line of sight.
 - e. The slope of the ground where the target resides.
14. There are three (3) methods of indicating targets:
 - a. Direct method.
 - b. Reference point method.
 - c. Clock ray method.
15. When indicating targets, the following information must be given:
 - a. Range.
 - b. Corrections - For wind, leads, or hold off.
 - c. Indications.
16. The sniper team must learn to work together in such a manner so that each knows exactly what the other means in as few words as possible. Before the sniper fires he must ensure that the observer is ready to "read" the shot.

17. The sniper team, before they start a mission, must agree and understand what methods will be used to indicate targets to the other and what methods will be used to ensure both are ready before the shot is made.

18. When firing over ground, the extent of its danger space depends on the relationship between:

a. The trajectory and the line of sight, or angle of fall, and therefore on the range and the circumstances of its trajectory.

b. On the height of the target.

c. On the point of aim.

d. On the point of impact.

20. For the given height of target and point of aim, the danger space is of fixed dimensions over level ground, while the swept space varies in relationship to the slope of the ground; being greater on falling ground and lesser on rising ground.

The following is a list of compensation factors to use in setting the sights of the sniper weapon system when firing from any of the following angles. To use this table, find the angle at which you must fire and then multiply the estimated range by the decimal figure shown to the right, i.e. estimated range is 500 meters, angle of fire is 35 degrees, set zero of weapon for:

$$500 * .82 = 410 \text{ meters}$$

<u>SLOPE ANGLE</u>	<u>MULTIPLY RANGE</u>
<u>UP OR DOWN</u>	<u>BY</u>
.05 deg.	.99
.10 deg.	.98
.15 deg.	.96
.20 deg.	.94
.25 deg.	.91
.30 deg.	.87
.35 deg.	.82
.40 deg.	.77
.45 deg.	.70
.50 deg.	.64
.55 deg.	.57
.60 deg.	.50
.65 deg.	.42
.70 deg.	.34
.75 deg.	.26
.80 deg.	.17
.85 deg.	.09
.90 deg.	.00

As can quickly be seen the steeper the angle the shorter the range will be set on the scope or sights to cause a first round hit. Also the steeper the angle the more precise you must be in estimating or measuring the angle. Interpolation is necessary for angles between tens and fives.

As an example 72 degrees is 40 % between 70 and 80 degrees

70 degrees = .34 and 75 degrees = .26

$(.34 + .26) / 2 = .30$ or 72.5 degrees = .30

72 degrees would equal approximately .31

A range of 650 meters at a 72 degree angle would equal:

$650 * .31 = 201.5$ meter zero.

Interpolation can be further carried out to 71 degrees or 74 degrees by using the same method with the .30 found for 72.5 degrees:

$(.30 + .26) / 2 = .28$ for 73.75 degrees or $(.30 + .34) / 2 = .32$ for 71.25 degrees

LEADS

INTRODUCTION

1. Gain Attention. You and your partner have been in position for several days without any luck at all, and are just packing it in when your partner catches sight of someone moving down a dry river bed, approximately 675 to 700 yards down range. You both decide that he is moving at about a 45 degree angle to you, and at average pace. You obtain what you think is the proper hold and lead for that range and squeeze the shot off. Your partner doesn't say anything, but looks at you and winks.

2. First round kill is the name of the game. Being snipers, you could very well be placed in this situation and when you are, will be expected to put that round right where it belongs on a moving target out to 800 yards.

3. Purpose.

a. Purpose. The purpose of this period of instruction is to provide the student with the knowledge of the proper leads to be used to hit a moving target (walking and running) at ranges from 100 to 800 yards.

b. Main Ideas. The main ideas to be discussed are the following:

- (1) Methods of Leading a Moving Target
- (2) Angle of Target Movement
- (3) Normal Leads
- (4) Double Leads

4. Training Objectives. Upon completion of this period of instruction, the student will, without the aid of references, understand and be able to demonstrate the proper lead necessary to hit a moving target at ranges from 100 to 800 yards.

TRANSITION. The best example of a lead can be demonstrated by a quarterback throwing a pass to his receiver. He has to throw the ball at some point down field to where the receiver has not yet reached. The same principle applies in shooting at a moving target with the sniper rifle.

BODY

1. LEADS. Moving targets are the most difficult to hit. When engaging a target which is moving laterally across his line of sight, the sniper must concentrate on moving his weapon with the target while aiming at a point

some distance ahead. Holding this "lead", the sniper fires and follows through with the movement after the shot. Using this method, the sniper reduces the possibility of missing, should the enemy suddenly stop, hit the deck, or change direction. The following is a list of ranges and leads used to hit moving targets both walking and running:

<u>RANGE</u>	<u>WALKING</u>	<u>RUNNING</u>
	<u>LEAD</u>	<u>LEAD</u>
100	Front edge of body	$\frac{1}{2}$ foot/body width
200	$\frac{1}{2}$ foot/body width	1 foot/body width
300	1 foot/body width	2 feet/body width
400	$1\frac{1}{2}$ feet/body width	3 feet/body width
500	2 feet/body width	4 feet/body width
600	$2\frac{1}{2}$ feet/body width	5 feet/body width
700	3 feet/body width	6 feet/body width
800	$3\frac{1}{2}$ feet/body width	7 feet/body width

Another method of leading a target, and one which is used extensively by the British, is known as the "Ambushing". By "ambush", we mean the sniper selects a point some distance in front of his target and holds the crosshairs or Mil Dots on that point. As the target moves across the horizontal crosshair or Mil Dot, it will eventually reach a point which is the proper lead distance from the center. At that instance, the sniper must fire his shot. This is a very simple method of hitting a moving target, but a few basic marksmanship skills must not be forgotten:

a. The sniper must continue to concentrate on the crosshairs and not on the target.

b. The sniper must continue to squeeze the trigger and not jerk or flinch prior to the shot being fired.

c. Some snipers tend to start with this method, but begin to track the target once it reaches that magic distance and then fire the shot. Use one of the two methods and stick with the one which you are confident will get that shot on target. (The instructor should draw these methods of leading on the chalkboard to better illustrate.)

TRANSITION. The sniper must not only estimate his target range, but also it's speed and angle of travel relative to his line of sight in order to determine the correct lead.

(a) Full Lead Target. When the target is moving across the observer's front and only one arm and one side are visible, the target is moving at or near an angle of 90 degrees and a full value lead is necessary.

(b) Half Lead Target. When one arm and two-thirds of the front or back are visible, the target is moving at approximately a 45 degree angle and a one-half value lead is necessary.

(c) No Lead Target. When both arms and the entire front or back are visible, the target is moving directly toward or away from the sniper and will require no lead.

OPPORTUNITY FOR QUESTIONS

SUMMARY

1. Reemphasize. During this period of instruction, we have discussed the two different methods most often used to lead a moving target and emphasized that it was important to stick with one method and not fluctuate back and forth between the two.

We covered the required leads that should be used to hit a moving target out to 800 yards.

In conclusion, we discussed how to estimate angle of target movement and use of a full lead and half lead. Double leads were covered and the situation was covered as when to apply them.

2. Remotivate. As you can see, the sniper must now become proficient in his ability to judge distance, how fast his target is moving, and at what angle the target is moving with respect to him and still put that first round on target at ranges out to 800 yards.

MOVING TARGETS

SCHEDULE

<u>Dates</u>	<u>Times</u>	<u>Location / Yd Line</u>	<u>Rounds Needed</u>
		R4 / 300 - 600 Yd Line	
		R4 / 300 - 600 Yd Line	
		R4 / 700 and 800 Yd Line	
		R4 / 700 and 800 Yd Line	
		R4 / 700 and 800 Yd Line	
		R4 / 300 and 800 Yd Line	
		R4 / 300 and 800 Yd Line	

REQUIREMENTS

1. Twelve (12) 12" FBI silhouette targets for all the above dates.
2. Seven (7) "A" type targets.
3. In addition to normal combat equipment, each sniper team will be equipped with sniper rifle and binoculars/Spotting Scope.
4. Student uniforms as directed.

1. State Purpose and Main Ideas.

a. Purpose. To make the sniper determine the proper leads necessary to hit a target walking or running at ranges of 100 to 800 yds.

b. Main Ideas. The main ideas to be discussed are the following:

- (1) Methods of leading a moving target.
- (2) Angle of target movement.
- (3) Speed of target.
- (4) Normal Leads.
- (5) Double Leads.

2. Training Objectives. Upon completion of this period of instruction, the student will:

a. Be able to understand the proper methods of leading a target at ranges of 100-800 yds.

BODY

1. Conduct of Firing Exercise.

a. The student will wear camouflage and move tactically during the moving exercise. Tactical movement for this exercise will consist of a low crawl from behind the firing point to the firing point (approximately 10-15 yds) and back.

b. Each sniper team will be given a block of targets that will be his firing position (approximately 35 ft long). Each sniper team must pick a firing position within his sector of fire and low crawl to his firing position.

c. The student then must load five (5) rounds of ammunition into his sniper rifle and wait until a target appears in his sector of fire.

d. Moving targets will appear on the far left sector first and far right sector second of the snipers firing sector.

e. When a target appears, the sniper's observer must tell the sniper where in the sector the target is, the wind element at the time of the sighting and any other element that may cause a error in a first round hit.

f. After the sniper has engaged his target and it is a hit, the target will go down and move to the far corners of their sector of fire and wait until all targets have reached this position. On command from the Pit Officer or OIC, all targets will be sent into the air and show their hits. The sniper's observer will then record his hold used and plot the impact of the shot.

g. If a target has reached the end of the sector and it has not been fired upon or hit, the student will bring the target into the pits. On command from the Pit Officer/OIC all targets will go into the air. A miss will be indicated by facing the back side of the target towards the firing line. On the command from the Pit Officer/OIC all targets will be taken back into the pits, and again on command from the Pit Officer/OIC, the next set of targets will come up and start to move from right to left in their sector of fire.

2. Conduct of Pit Officer/OIC.

a. To insure targets, pasters, and spotters are available for each target.

b. To insure all targets are spaced:

- (1) Pit team 1 - 1-8
- (2) Pit team 2 - 9-16

- (3) Pit team 3 - 17-24
- (4) Pit team 4 - 25-32
- (5) Pit team 5 - 33-40
- (6) Pit team 6 - 41-50

c. To insure that two (2) students are manning each moving targets.

d. To contact the Conducting Officer/OIC when pits are ready to start the firing exercise.

e. On command from the Conducting Officer/OIC each student will raise a moving target at the far left sector of fire, (e. g. 1, 9, 17, 25, 33, 41) and start walking from left to right or to the end of the firing sector (e. g. 8, 16, 24, 32, 40, 50).

f. The Pit Officer/OIC must insure that all targets start at the far left sector of fire first. (e. g. targets 1, 9, 17, 25, 33, 41)

g. On command, raise all moving targets and walk to the end of the sector (e. g. 8, 16, 24, 32, 40, 50).

h. Insure that if a target is hit, the student pulls the target into the pits and walks to his far sector or end of his sector and waits. If a target is not engaged or the sniper fires and misses, insure that the target keeps moving until it reaches the end of the sector and then brought down into the pits.

i. On command from the Conducting Officer/OIC, all targets will appear to show the student their impact. If it is a miss, the back side of the moving target will appear. On command all targets will be taken back into the pits.

j. Again on command the next set of targets will start to move from right to left.

k. If the student hears the word "mark" in their sector of fire, he will pull the target down and look for a shot. If an impact hole can not be found, raise the moving target and walk to the end of the sector.

3. Scoring.

a, The value of each hit will be determined by the formula
 $V = R / 100$; V = value of the hit, R = the range

i.e. $V = 500/100 = 5$

$V = 600/100 = 6$

$V = 300/100 = 3$

b. Misses will be scored as zero.

c. Passing score for a firing exercise will be 80% of the total points available.

FORMULA TO DETERMINE WIND CORRECTION IN MILS

1. DETERMINE WIND CORRECTION

$$\frac{\text{RANGE} \times \text{VELOCITY}}{15} = \text{WIND CORRECTION IN M.O.A.}$$

14	600 yds
13	700 yds
13	800 yds
12	900 yds
11	1000 yds

2. CONVERT NORMAL MIL LEAD INTO M.O.A.

$$\text{LEAD IN MILS} \times 3.375 = \text{LEAD IN M.O.A.}$$

3. SUBTRACT NORMAL LEAD IN MILS CONVERTED TO M.O.A. FROM WIND CORRECTION IN M.O.A.

$$\text{LEAD IN M.O.A.} - \text{WIND CORRECTION IN M.O.A.} = \text{CORRECT LEAD IN M.O.A.}$$

4. TO DETERMINE NEW LEAD IN MILS $\div$ CORRECT LEAD IN M.O.A.

$$3.375 = \text{LEAD IN MILS} \div \text{NEW LEAD IN M.O.A.}$$

EXAMPLE.

500 yard shot with 8 m.p.h. full value wind from the right.

$$1. \quad \frac{(5 \times 8)}{15} = 2.6 \quad 2. \quad 1 \frac{1}{4} \times 3.375 = 4.75 \text{ MOA} \quad 3. \quad 4.75 - 2.6 = 2.15 \text{ MOA}$$

$$4. \quad 3.375 \div 2.15 = 1.5 \text{ MILS}$$

MOVING TARGET LEADS
NOTE: HOLDS ARE FROM CENTER OF TARGET

WALKING-2 MPH

<u>RANGE</u>	<u>MILS</u>	<u>MOA</u>	<u>FEET</u>
100 yards	Leading edge of target.		
200 yards	1	3	0.5
300 yards	1 1/8	4	1.0
400 yards	1 1/4	4.5	1.5
500 yards	1 1/4	4.75	2.0
600 yards	1 1/2	5.0	2.5
700 yards	1 1/2	5.0	3.0
800 yards	1 1/2 (1 3/4)	5.25 (5.5)	3.5 (3.75)
900 yards	1 1/2 (1 3/4)	5.25 (5.5)	4.0 (4.25)
1000 yards	1 3/4	5.5 (5.75)	4.5 (5.0)

RUNNING SHELL

100 yards	1 3/4	6	0.5
200 yards	1/34	6	1.0
300 yards	2 1/4	8	2.0
400 yards	2 1/2	9	3.0
500 yards	* 2 3/4	9.5	4.0
600 yards	* 3	10	5.0
700 yards	* 3	10.25	6.0
800 yards	* 3	10.5	7.0
900 yards	* 3 1/4	10.75	8.0
1000 yards	* 3 1/4	10.75	9.0

*Running targets are not recommended at these ranges due to the leads required. If target must be engaged then use windage knob and hold directly on the leading edge of the target. Example, runner left to right, 600 yards, use right 10 minutes of angle and hold on his leading edge.

FAST WALKERS-3-4 MPH

<u>RANGE</u>	<u>MILS</u>	<u>MOA</u>	<u>FEET</u>
100 yards	Leading edge of the target		
200 yards	1 1/4	4.5	0.75
300 yards	1 3/4	6.0	1.75
400 yards	2	6.5	2.5
500 yards	2	6.5	3.0
600 yards	2	6.75	4.0
700 yards	2	6.75	4.5
800 yards	2 1/4	8.0	5.5
900 yards	2 1/4	8.0	6.75
1000 yards	2 1/2	8.5	7.5

It must be emphasized that these are beginning leads only. Each individual will have his own lead for any given time and/or circumstances. The wind will also play a very big factor in the lead used for a given shot at a given range. As an example, a walker at 600 yards moving from left to right with a wind of 15 mph from left to right will change the lead from 2.5 feet or 1.5 mils to the leading edge of the target. ($15 * 6 = 90/10 = 9/2 = 4.5$ MOA. Normal lead for a walker at 600 yards is 5 MOA, a difference of .5 MOA or 3 inches at 600 yards.)

Half leads for angular movement and double leads for movement towards the shooters shooting hand must also be computed into the lead.

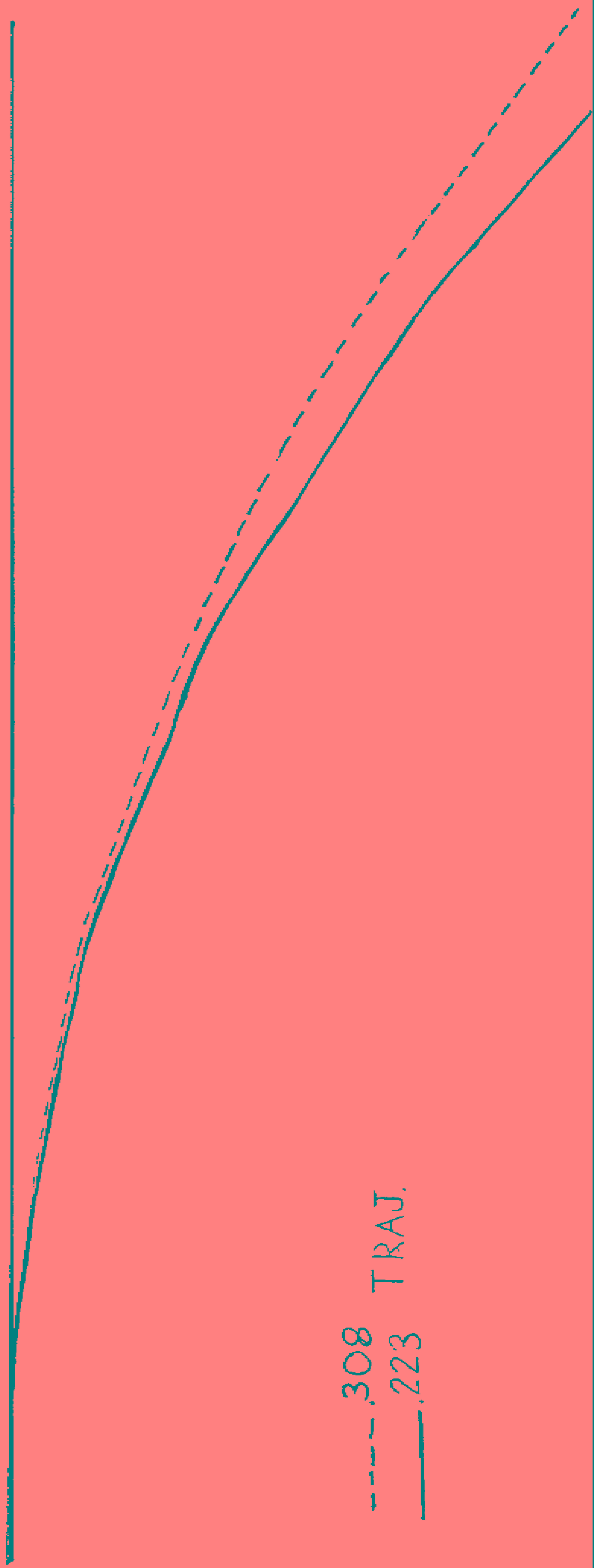
.224 dia., 55 gr. FULL METAL JACKET B.T.

RANGE YARDS			MUZZLE	100	200	300	400	500
VEL. FPS			2900	2545	2187	1860	1453	1139
ENERGY FT. LB.			1027	791	584	422	258	158
DROP INCHES			00	-2.22	-9.85	-24.81	-50.13	-92.26
WIND DEFLECTION INCHES								
	10 MPH	00		1.15	5.33	13.31	27.05	50.21
	20 MPH	00		2.31	10.65	26.61	54.10	100.42
	30 MPH	00		3.46	15.98	39.92	81.16	150.63

.308 dia., 150 gr. FULL METAL JACKET B.T.

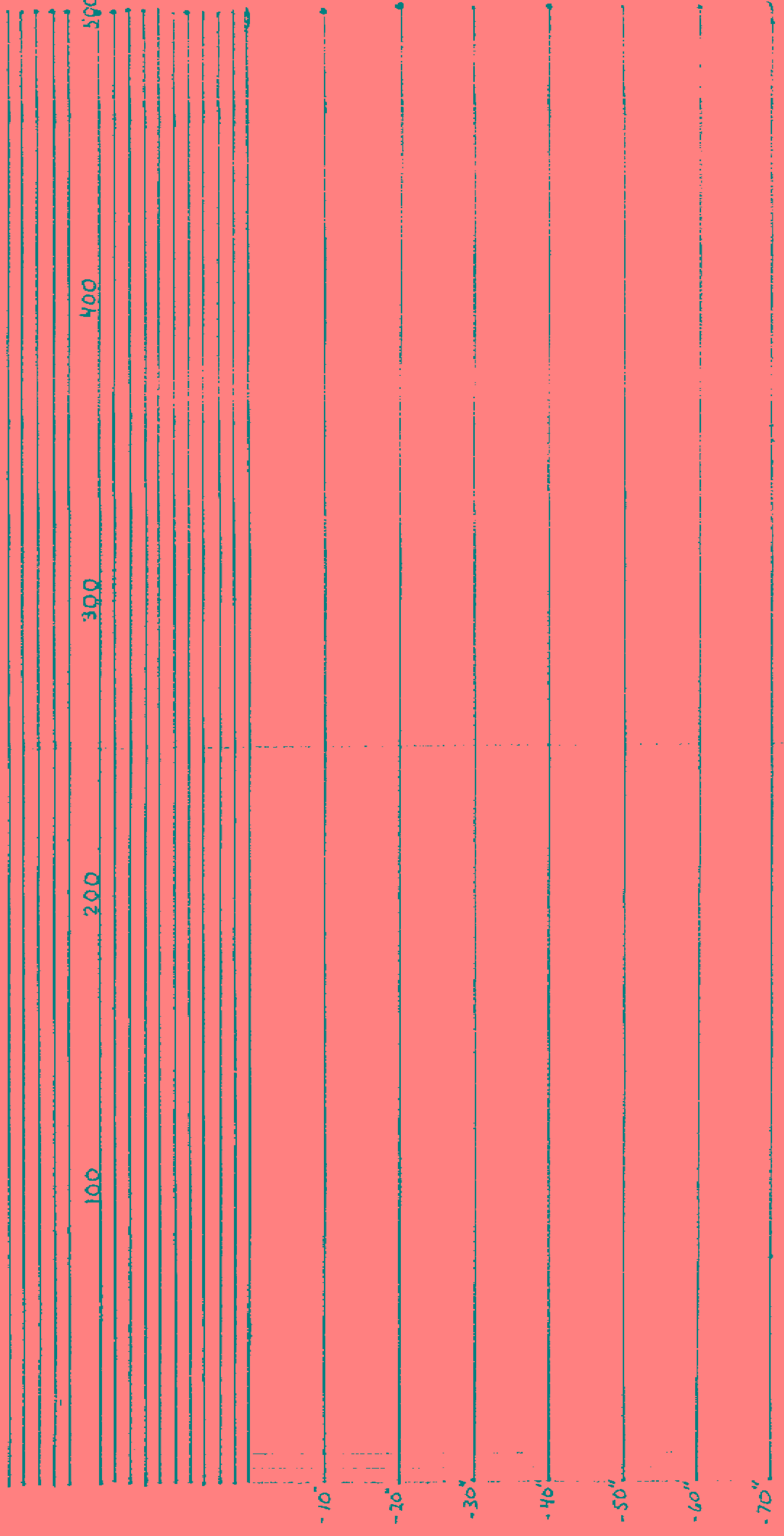
VEL. FPS			2800	2597	2404	2218	2041	1872
ENERGY FT. LB.			2611	2247	1924	1638	1387	1167
DROP INCHES			00	-2.30	-9.76	-23.24	-43.80	-72.72
WIND DEFLECTION INCHES								
	10 MPH	00		.72	3.00	7.01	12.97	21.13
	20 MPH	00		1.45	6.00	14.02	25.94	42.25
	30 MPH	00		2.17	8.99	21.03	38.91	63.38

---.308 TRAJ.
— .223

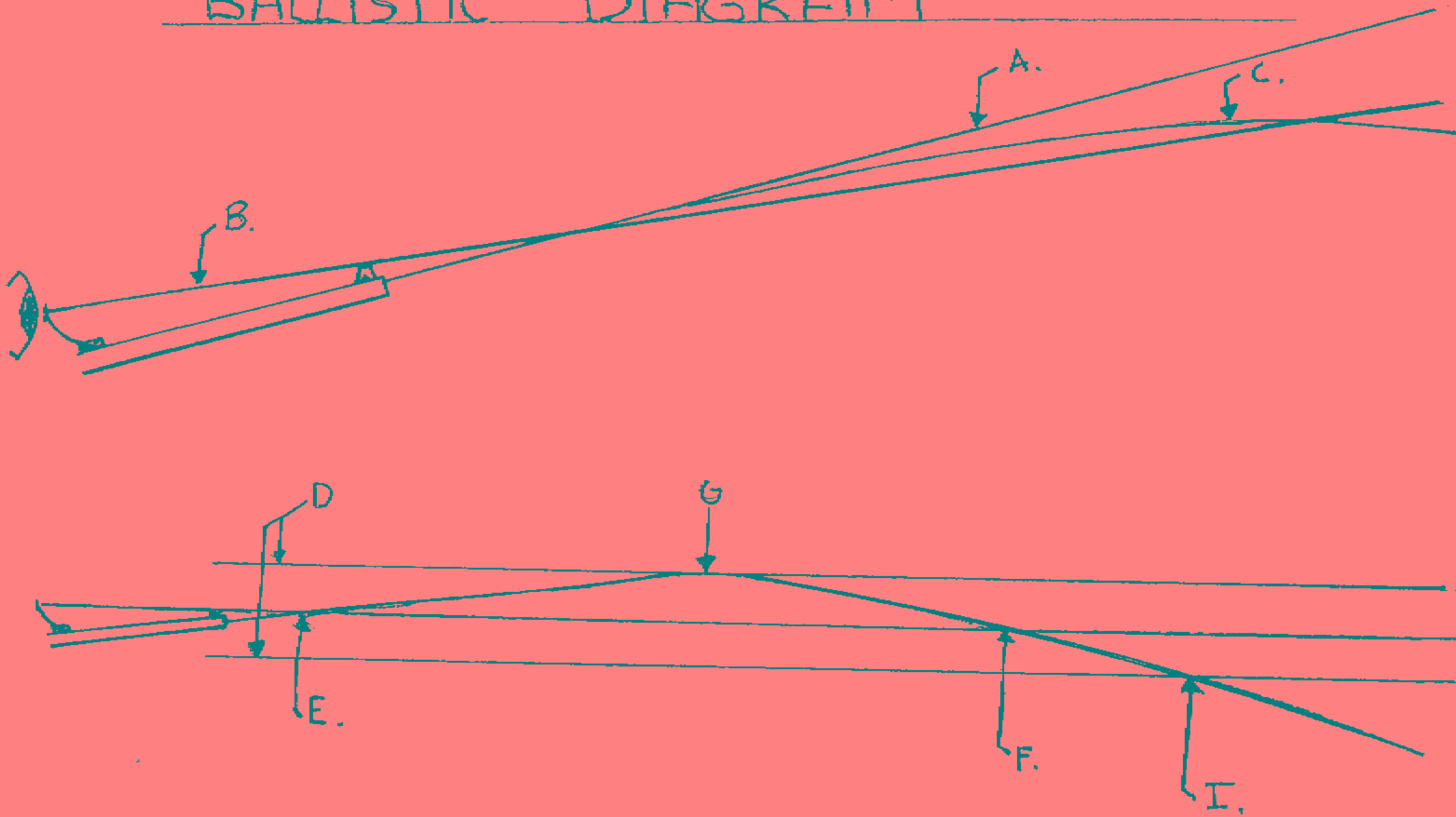


VITAL ZONE

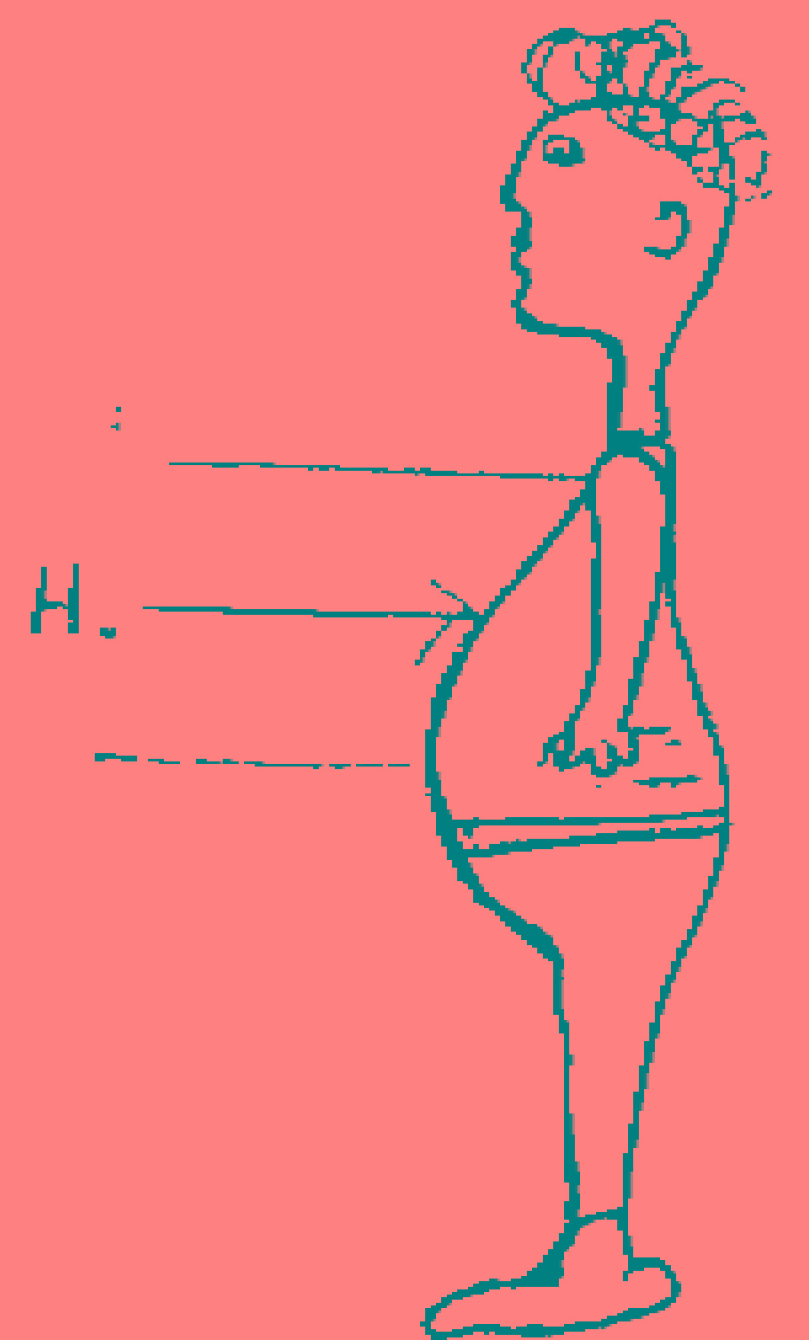
150 GR FMJ 308 @ 2800 FPS
55 GR FMJ .223 @ 2900 FPS



BALLISTIC DIAGRAM



- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____
- G. _____
- H. _____
- I. _____



LESSON OUTLINE

SPECIAL OPERATIONS

INTRODUCTION

1. Gain Attention. The continuation of a sniper program in Special Warfare will depend on how well, you as snipers can support the Seal Platoons to carry out their assigned mission or independent sniper operations.
2. Purpose. This lesson outline is constructed to better advise the Seal Scout Sniper to employ himself by giving a better understanding of weapons, tactics, and employment involving, Haskins 50 Cal S.W.S., Ship Boarding, Across the Beach operations, HAHO Airborne Insertions.
3. Training Objectives. At the end of this period of instruction you should be able to:
 - a. Describe the tactical employment of snipers in, 50 Cal. S.W.S. Operations, Ship Boarding, Across the Beach and HAHO Operations, involving snipers in the support of Seal Platoons, or conducting independent Seal Sniper Operations.

BODY

1. General. Before we can start, we first must know what exactly is meant by the term "Special Operation". Special Operations involving Seal Scout Snipers can be considered any mission that is not normally encountered by your standard Seal Sniper.

1. 50 Cal S.W.S

(1) Capabilities

- (a) Maximum effective range - 2000 - 3000 meters
- (b) Less than one minute of accuracy.
- (c) 20X Leapole Vitra M1 Telescopic sight allows for:
Improved target identification and location.
- (d) Used primarily in engaging hard targets

(2) Limitations

- (a) Single shot bolt action; not capable of semi-automatic fire

(b) Weight - 40 lbs.

(c) Requires special maintenance and repair

(3) Ammunition

(a) Armor Piercing

(b) Ball ammo.

(c) Tracer

(d) Incenerary

(e) RDX

4. Sniper Employment

A. General

(1) Effective sniping by well-trained and well-organized snipers will do more than inflict casualties and inconvenience to the enemy. It will have a marked effect on the security and morale of enemy personnel.

(2) The method by which Seal Snipers are employed will be controlled by many factors:

- Nature of the ground (Terrain)
- Distance (To the target)
- Existence of obstacles
- Insertion and extraction methods
- Degree of initiative shown by the enemy
- Type target (Hard/Soft)
- Number of snipers available.

(3) The 50 Cal S.W.S. was designed to engage hard targets from extended ranges up to 2000 meters, due to the excessive weight of this weapon, makes the employment of a two man Sniper Team impractical. The three man Sniper Team concept has been developed, to adjust for the weight problems encountered when using this weapon.

a. PT Man - will carry all communications equipment, normally will also be O.I.C.

b. Sniper - will be responsible for carrying the upper receiver of the 50 Cal S.W.S.

c. Observer - Responsibilities will be to call wind for the sniper, carry the lower receiver, bolt, muzzle break, 50 Cal ammo., spotting scope, range finder.

d. Depending on the mission and the number of snipers required to carry out the assigned mission, it may be necessary to employ more than one 3 man Sniper Team.

2. Ship Boarding Sniper Operations

A. General. The employment of snipers to support a ship boarding assault is an asset available to the Assault Force Unit Commander. The employed seal sniper team's objective is to set security for the assault teams moving to the ship, while boarding, moving to their set point, during the assault and after the assault has taken place.

B. Employment. The employment of sniper teams will depend on:

- Number of sniper available
- Terrain
- Obstacles
- Number of Targets
- Distance.

The sniper team will consist of a two man sniper team (sniper/observer). These snipers should set 360° security around the target ship if possible. These sniper teams when possible should be employed in advance of the main assault force. By placing these sniper teams into position in advance, reliable information can be passed back to the main assault force of the situation on and around the target area. This information will be relayed back to the assault force unit commander to assist him in planning his operation.

(a) When using snipers in reduced light conditions all friendly forces should be marked in a way which clearly identifies them as such. Depending on what night vision devices are being used by the snipers (active or non-active I.R. sources) will depend on the marking procedures.

(b) Active I.R. Sources

1) I.R. laser designators - I.R. tape (glint) should be worn by all friendlies.

(c) Non Active I.R. Sources

1) Night Vision Scopes - I.R. Chem lights should be worn by all friendlies.

d) Helo Support - One method available to a sniper team when employment of sniper teams in advance is not feasible.

1) Employment - Two Helos will normally be used, one port and one starboard of the target ship. Two snipers will be employed with each Helo. One sniper on each side of the aircraft.

2) The responsibilities of the aircraft is to set 360° security on the target, while the main assault force assaults the target ship.

3) Equipment.

- Night vision capability
- I.R. Lazer Designator w/weapons.

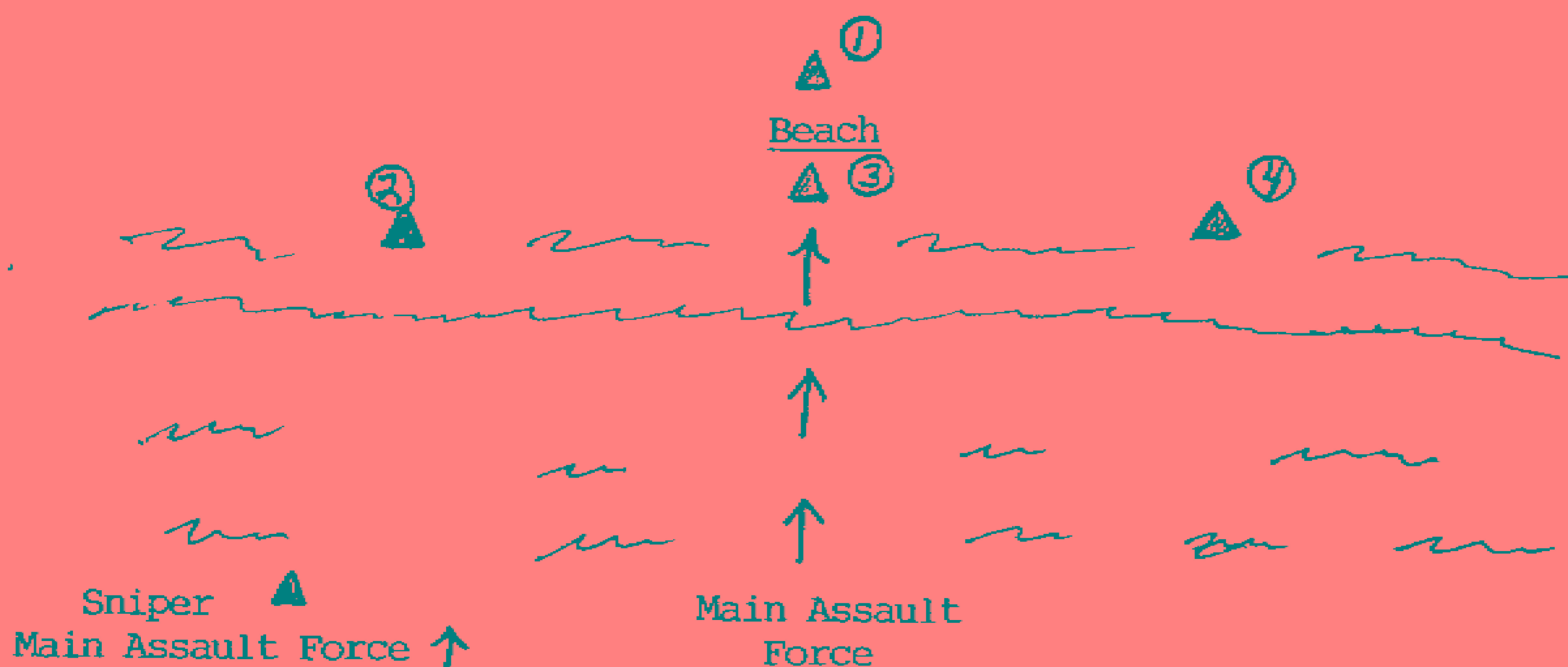
3. Across the Beach Operations

General. Across the Beach operations involving snipers will be conducted in two methods:

- In direct support to a larger assault force
- independent sniper operations

1) Employment. (Support of Larger assault force)

A) The employment of sniper teams to support a larger assault force is an asset that can be used by the supported Unit Commander. Snipers should be employed if possible ahead of the main force (24-48 hours) to set security, and to mark the exact locations for the main force to come across the beach. Sniper teams should set security 180° to the front of the main force, 2, two man sniper teams should be used if possible.



2) Snipers Responsibilities. The number one man is responsible for frontal security. Number two and four men are responsible for flank security, number three man's responsibilities are to mark the beach, link up with the main force to pass any information, and to guide the main force to the objective. After the main force has moved from their ~~extraction~~ point, sniper 1, 2, and 4 will have two options:

- They can move with the main force
Keep flank and frontal security
- Remain behind the main force to set security, and
help guide the main force to their extraction rally point.

If sniper teams cannot be employed ahead of the main assault force, sniper teams should come across the beach with the main assault force. Once the sniper teams are on the beach, their primary job is to set 360° security for the main assault force. Situation will dictate how snipers will be employed. Main points to remember, snipers are best employed where the main force is most vulnerable.

- Moving across the beach
- Moving from the objective rally point to the object
- Moving from the objective ~~TO THE EXTRACTION RALLY PT.~~
- Moving from the extraction rally point, for extraction back out to sea.

B) Independent Sniper Operations

When conducting across the beach operations that involve snipers or very small units (1-4 men) the following tactics are best used:

1. Movement Across the Beach. Snipers should swim in a swimmer pool while swimming to the beach. Once the sniper team or teams have reached a point approximately 200 meter out from the shore line should get on line facing the shore line in order to observe the beach for any movement.

Once the sniper team(s) have reached a point where they can stand up and remove their fins the following actions should be observed:

- Before removing their fins, the sniper team should observe the beach for any enemy movement.
- Once the team is confident the beach is secure. One member at a time will remove his fins and prep any equipment for movement across the beach.

Once ready, all members will move together on line across the beach. Once across, the sniper team will proceed to their initial rally point, to prep any weapons or equipment for movement to the objective rally point.

2. Tactics. Involving movement across the beach should consider the following:

- Movement across the beach involving 1-4 men should not employ swimmer scouts. Due to the small numbers this tactic is not feasible.
- Movement from the surf zone to the beach should be carried out with all personnel on line. This tactic, will bring all guns to bear if the sniper team is compromised while moving across the beach.

4. HAHO, HALO Airborne Operations.

General.

HAHO/HALO Operations involving sniper teams can be carried out in support of a main assault force or independently.

1. In support of a Assault Force. Sniper teams (if feasible) should be employed ahead of the main force (24-48 hours) to support the main forces Unit Commander in the following areas:

- To gather information on the objective area.
- To set security for the main force's D.Z.

- Mark D.Z.
- Guide main force to the objective.

2. Independent Sniper Operations. (HAHO)

General. When conducting HAHO operations involving (1-4) sniper groupings the most important factor to consider.

The use of HAHO operations is feasible only when the need to offset the release point due to:

- Risk of compromising the D.Z.
- Threats to aircraft (AAA sights).
- Insertion aircraft cannot deviate from normal flight path.

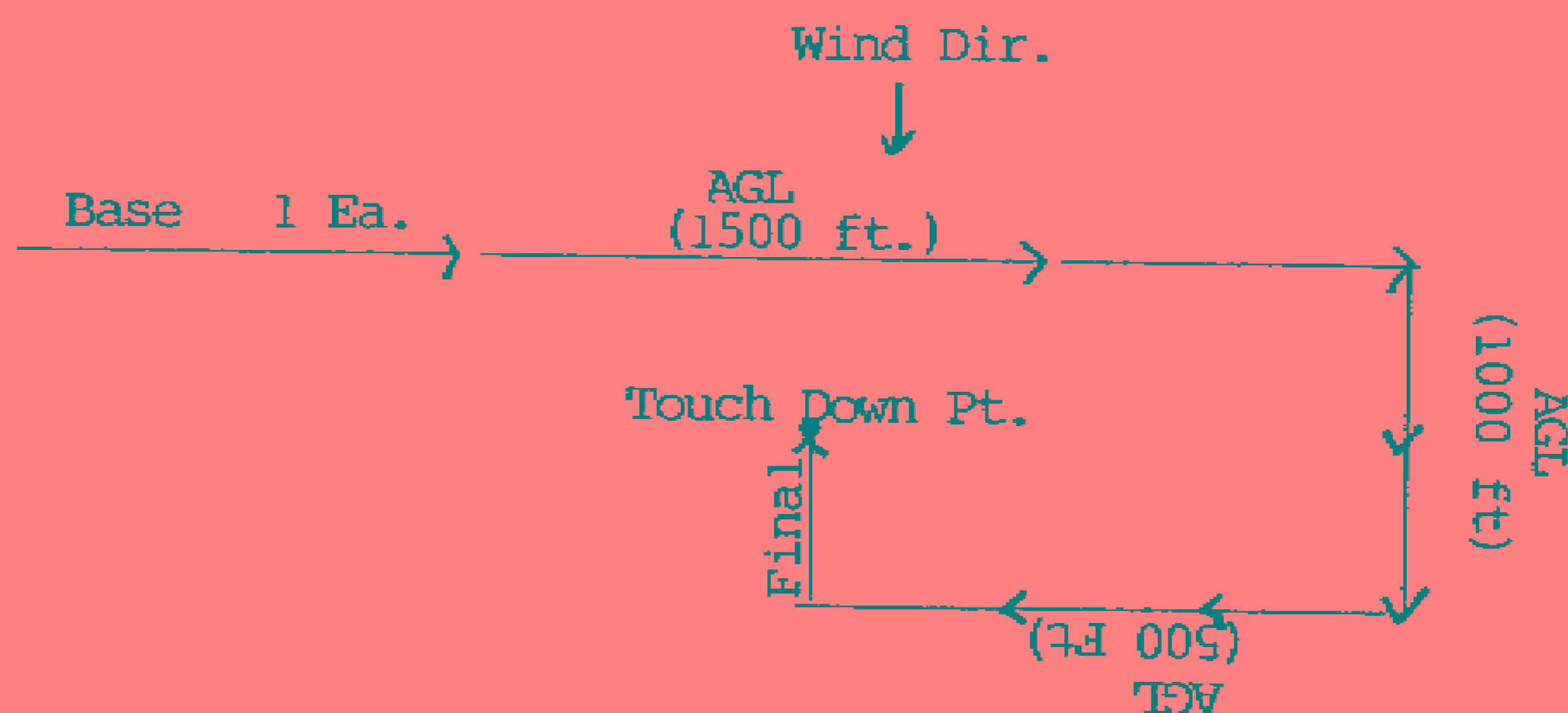
A) Grouping. Due to the small numbers involving snipers (1-4) grouping of all personnel is of great importance. In the employment of snipers the loss of one member will most likely result in the cancellation of the assigned mission.

B) Flight Formation. The staggered stack formation is best employed (2S up/2S back) This offers the most control.



C) Base Leg. The base leg of the flight formation into the DZ should consider the following:

- Altitude. (1500 foot max) The higher the altitude the higher the risk of compromising the D.Z.
- Boxing. Right hand turns into the D.Z. Should be maintained at all times.



- Note: If altitude should be bled off approximately one mile out from the D.Z. The flight leader should do Flate S turns. He should give a visual signal to the rest of the formation by moving his leg in the direction of the turn.

- Compass Heading - Once exiting the aircraft and jumpers have ensured a clear airspace, they should immediately assume their compass heading into the D.Z. After the formation is heading on the correct compass heading the jumpers should assume their slots in the formation.

- Stick leader. Is usually the heaviest or most experienced jumper. His position upon exit from the aircraft will depend on what type of release the jumpmaster has selected.

Cross Wind Release - Middle of the stick

Upwind Release - Front of stick

The stick leaders responsibility is to safely navigate the flight formation to the D.Z.

- Action on the D.Z.- One word will sum this up "security".

NOTES:

1. Marking jumpers (stick leader)

- A. Stick leader should be marked with chemical lights and strobe light
- B. Chem lights should be attached to the backpack of the MTIX reserve. Two blue, one red chem light attached to the rear right foot and green chem light to the left foot.
- C. This marking procedure is used to positively ID the stick leader and to aid the stick leader in signalling his intentions when making right or left turns.
- D. The stick leader should move the leg that corresponds to this desired turn.

2. Actions on the DZ

- A. Rally points (primary and secondary) should be predesignated prior to insertion.
- B. Once safely on the DZ, and depending on the type of mission and situations, parachutes should be gathered up (para bags should be reused), and all jumpers should move to a central location. Once there, 360° security should be established and all chute and equipment should be buried. If time and mission dictate that chutes and supporting equipment cannot be buried, all equipment should be centralized and cammied as best possible.
- C. Security is a prime consideration 360°. One man digs while others keep security.

LESSON OUTLINE

Aircraft Surveillance and take down

1. Purpose. To enable the SEAL Scout Sniper to employ himself during surveillance and aircraft take down.
2. Training objectives. Discribe and demonstrate the tactical employment of SEAL Scout Snipers during an aircraft surveillance and takedown.

BODY

1. General. Snipers will be utilized in the intial pre-assualt surveillance to help coordinate a well planned assualt. once the assualt order has been given the SEAL sniper's primary responsibilities will be security of the assualt force, surgically remove as many identified targets as possible and the disablement of the target aircraft, additional resposibilities:
 - Gathering of pertinent information for intelligences purposes.
 - Selective target elimination.
 - Aircraft takedown in conjunction with breachers and assualt teams.
 - Assualt force security while moving to their aircraft set point, during the assualt and after the assualt force has assualted the aircraft.
 - Photographic reconn.

2. Employment. The employed SEAL snipers will be divided into two separate elements with additional command and control element. Once all sniper elements are in place communication will be establish with the command and control element. Each element will be designated their own radio frequency. The two elements will be designated PAPA and SIERRA (Papa is designated the port side of the aircraft and Sierra the right side of the aircraft) The number of Sniper teams to be employed will depend on the following:

- Terrain.
- Type of aircraft.
- Number of snipers available.
- Duration of mission.

Individuals or sniper teams in each element will be numberered, begining at the front of the aircraft cockpit area (i.e. PAPA 1,3,5,7 & SIERRA 2,4,6,8,). SIERRAs will be even numbers and PAPAs will be odd numbers. Sniper or sniper teams will set security 360 degrees around the target aircraft.

3. Pre-deployment checks. The following checks should be accomplished prior to employing snipers into the field:

- Communications checks between individuals or sniper teams, command and control element, assault team forces and ground force unit commander.
- Test fire weapons.
- Coordination between assault teams leaders and breachers.
- Test all obsevation and photographic equipment.
- Brief all snipers on mission and individual responsibilities.

4. Responsibilities of employed sniper teams.

- Report status of all aircraft entry points. (i.e. open, close, boarding ladders, booby traps, tampering, door blockage).
- Report status of all windows, open or shut.
- Report movement by windows or entry points and possible identification of personnel (good , bad).
- Report areas of frequent use and identify by whom.
- Photograph any personnel if possible.
- Report any weapons and what type if possible.

- Describe any personnel and clothing they are wearing, physical characteristics of any personnel.

- Report any situation or event that could compromise the assault force or any possible threat to any hostages.

- During the assault stage report status of targets to command and control element (the word "green" or "red", green meaning sniper has identified a threat and can engage that threat, red meaning sniper has no target to engage.)

- During the assault teams movement to the aircraft the words ("stop & go") will be relayed to the command and control element which will be relayed to the assault force's team leader. The word "stop" meaning possible compromise stop all movement, "go" meaning continue with movement. (This is normally done when the assault force is making their move to the aircraft set point.)

4. Emergency assault. If a situation develops which an emergency assault (normally conducted if mission is compromised or extreme threat to hostages exist) is necessary, snipers will remain in position or if sniper have not be able to reach their (F.F.P.) final firing position that will take up an hasty firing position. Their responsibilities will be to engage any threats to the assault team and hostages as they appear untill the assault has commenced their assault on the target aircraft. After the assault has taken place all snipers will remain in place in order to maintain 360 degree security of the assault force unless so directed by the command and control element. (This is normally done for further identification of hostages and terrorists. A minimal sniper force should be left in position to maintain security).

a. The use of cover fire or diversionary fire through the upper 1/3 of the aircraft to encourage all personnel inside the aircraft to get down untill the assault team arrives.

5. Deliberate assault. This is when all sniper and assault teams have the time to fully prepare their selfs for the assault. The snipers will preform the following tasks:

- Move to (F.F.P.) final firing position and establish position by constructing range card, setup observation and photographic equipment.

- Commence surveillance.

- Depending on sniper's position and area of responsibility, select proper bullet.

(Solid lead or Sabo round for aircraft windshield copper jacket ammo should not be used because of the frag hazard copper jacket ammo can be used to engage targets in open doors or windows.)

- Test communication with all units. There should be three sperate radio freqs:

1. Primary - Sniper to Sniper command and control element.

2. Secondary - Sniper to assault team leader.

3. Secondary - Sniper to sniper.

NOTE: When establishing communication all snipers should have an capability to engage targets at one time in unison. This is referred to as synchronized or synchro firing. By engaging all targets at one time there is no time for the threats to react to an situation where one of their comrades has taken a hit, which gives the bad guys time to kill an hostage.

Once communication has been established between snipers and command and control and the situation warrants to engage any threats by synchro fire (normally this is done in unison with breaching the aircraft just slightly before the breach. This will reduce the number of bad guys the assault force has to deal with.) the communication format is as follows:

- Snipers stand by "GREEN".

- Snipers "READY", "READY", "READY" , "FIRE".

all targets will be engaged, if the word fire is not said sniper will not engage target, if there is a delay in the sequence the format will be completely started over.

The word "BLACK" means donot engage targets donot fire.

4. Set security for breaching and assault teams.

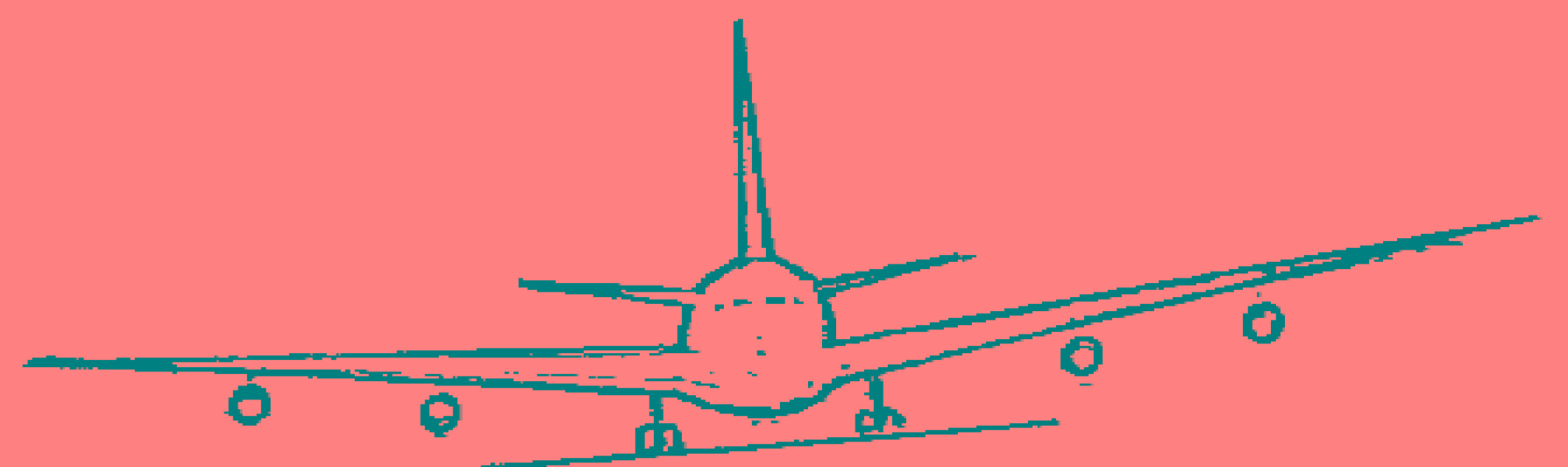
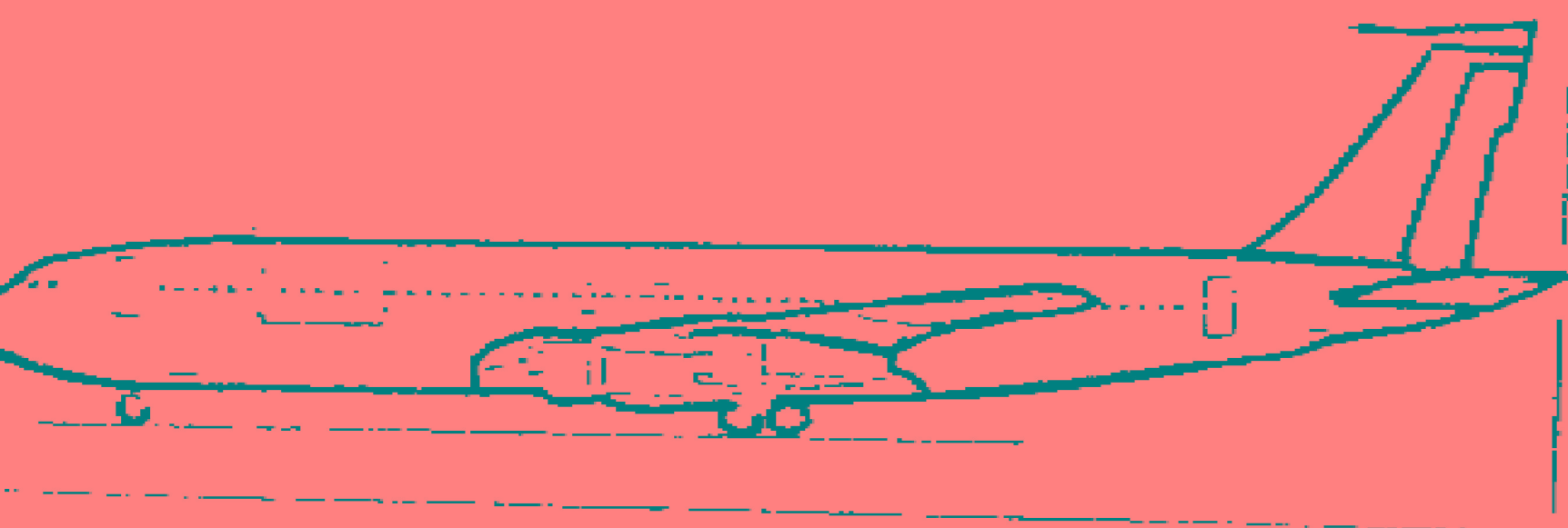
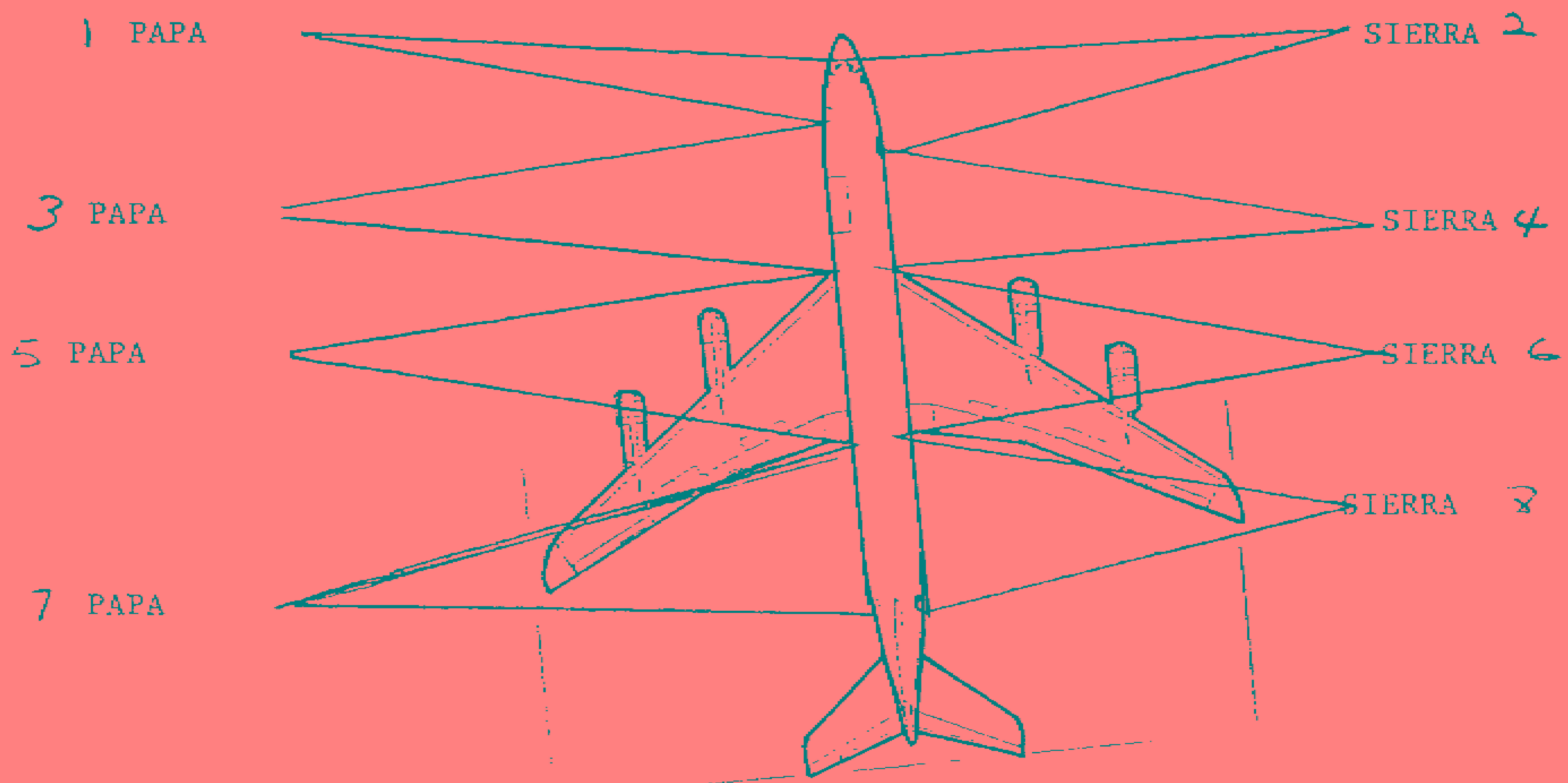
5. Upon aquistion of correct number of targets (ground force commander will relay sniper command and control to engage targets, command and control will only relay the order to shoot upon the order of the ground force commander.)

6. Essential equipment.

- Remington model 700. or 300 windmag.
- Communictions equipment MX-300R OR MX-360. hand raidos.
- Spotting scope.
- Binos.
- Map of area.
- Log book if working in sniper teams.
- Range card.
- Range finder if avaible.

- Radio pouch.
- 40 rounds 7.62 Or 300 windmag.
- Standard issue side arm with 30 rounds.
- Red lens flash light.
- Strobe light.
- Depending on the situation the option of using night vision scopes should be included with all snipers.
- Secondary weapon with M-845 night vision device.
- Terrain and climate will dictate uniform.

BOEING 707



Boeing 707 320C four-turbofan passenger cargo transport aircraft. (Pilot Press)

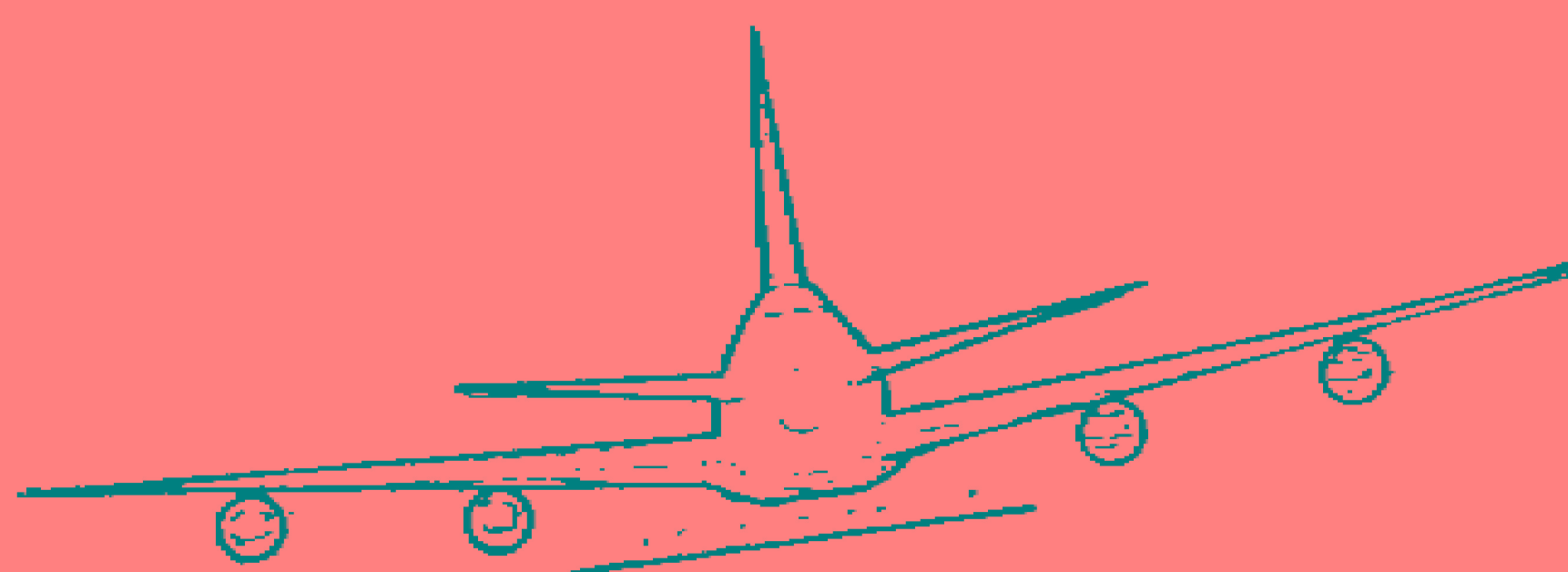
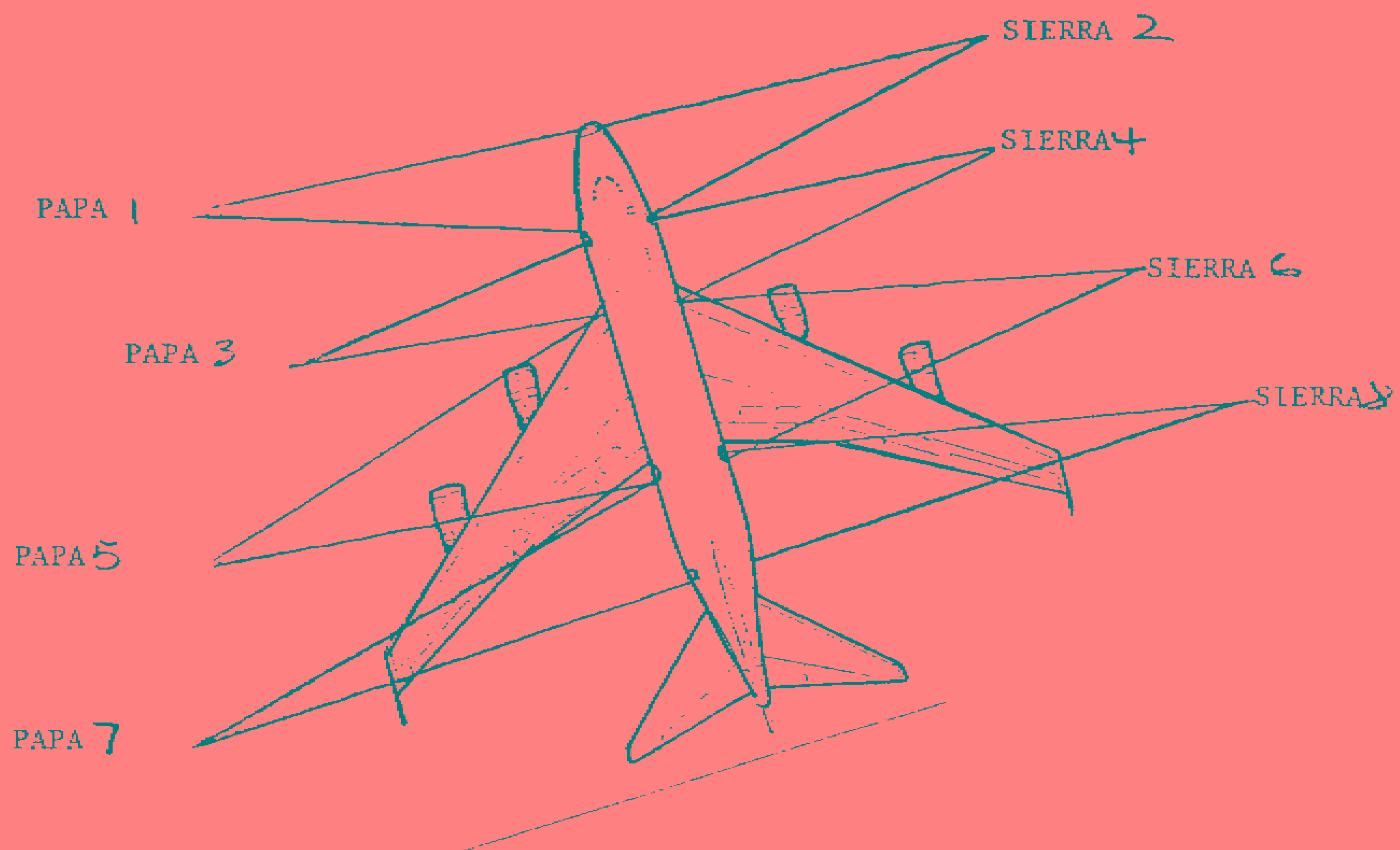
COCKPIT AND FRONT EXIT

WINDOWS FROM FRONT EXIT TO LEADING EDGE OF WING

ALL WINDOWS OVER WING AND ALL WINDOW EXITS

WINDOWS AFT OF WING AND REAR EXIT

FIRING POSITIONS CAN BE THE SAME AS OBSERVATION POSITIONS BUT CAN BE MOVED TO COVER SUSPECT AREAS OR MORE HEAVILY USED EXITS OR WINDOWS.

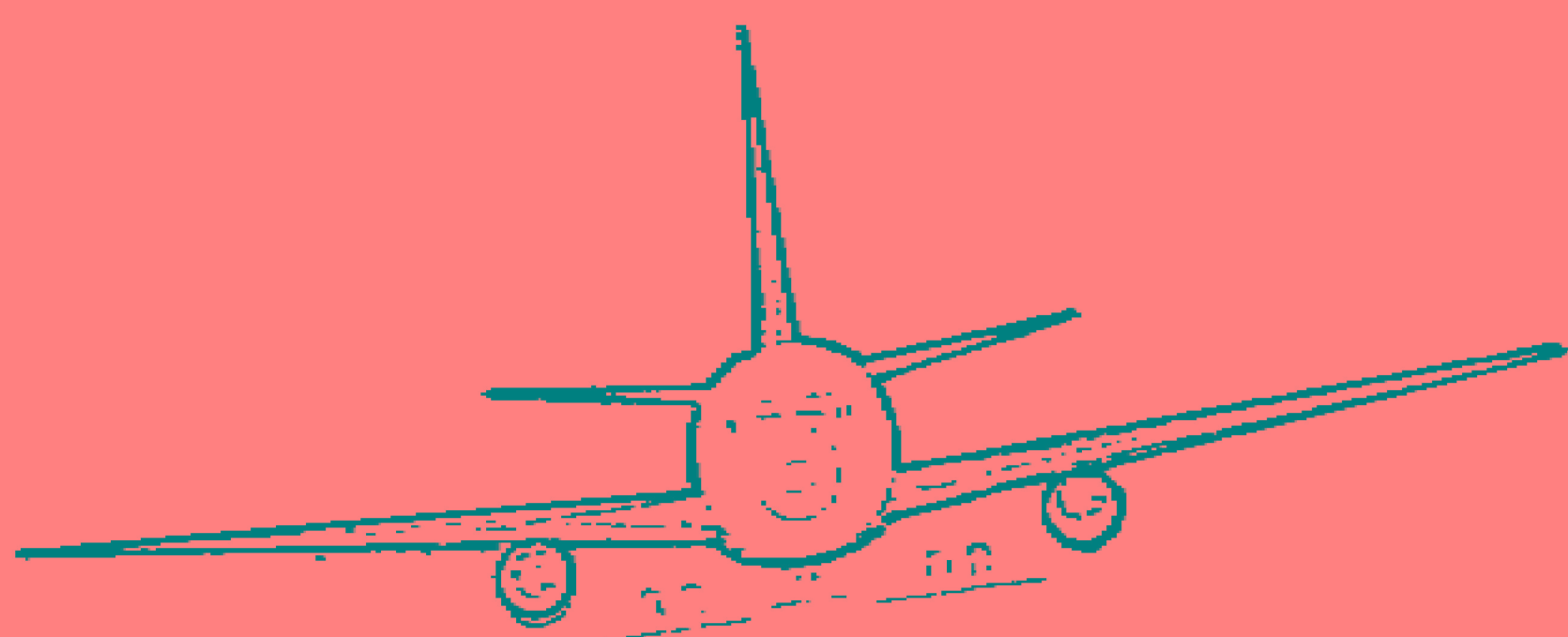
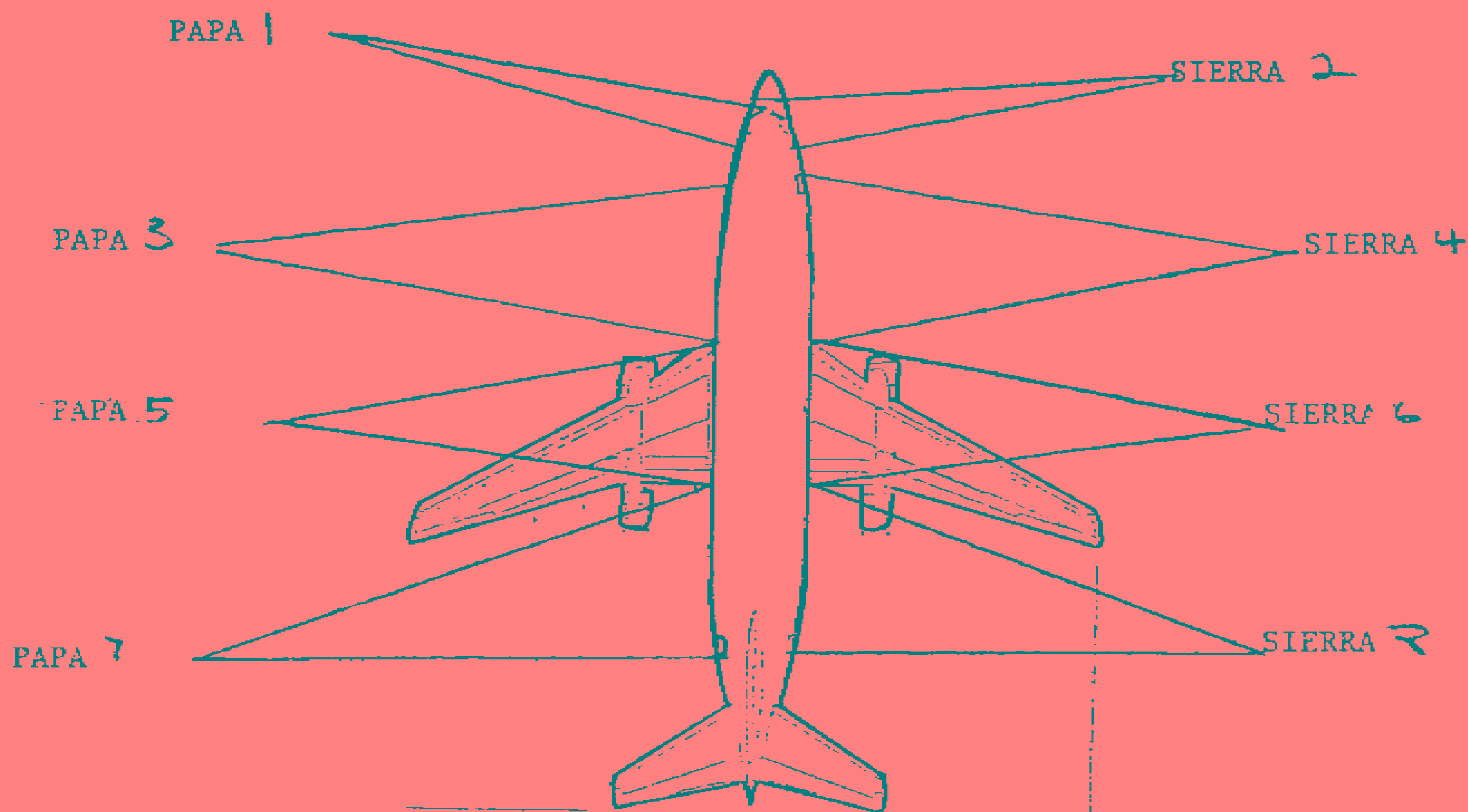


Boeing 747SP short-fuselage range version of the 747. (Pilot Press)

COCKPIT AND LOWER WINDOWS TO FRONT DOOR
 FRONT DOORS TO WING EXIT AND UPPER DECKS
 WING EXIT FRONT TO WING EXIT REAR
 REAR WING EXIT TO REAR DOOR

FIRING POSITIONS CAN BE THE SAME AS OBSERVATION POSITIONS BUT CAN BE MOVED TO BEEF UP SUSPECT AREAS OR COVER HEAVILY USED EXITS OR WINDOWS.

BOEING 737-200



Boeing 737-200 twin-turbofan, short-range transport. (Pilot Press)

COCKPIT

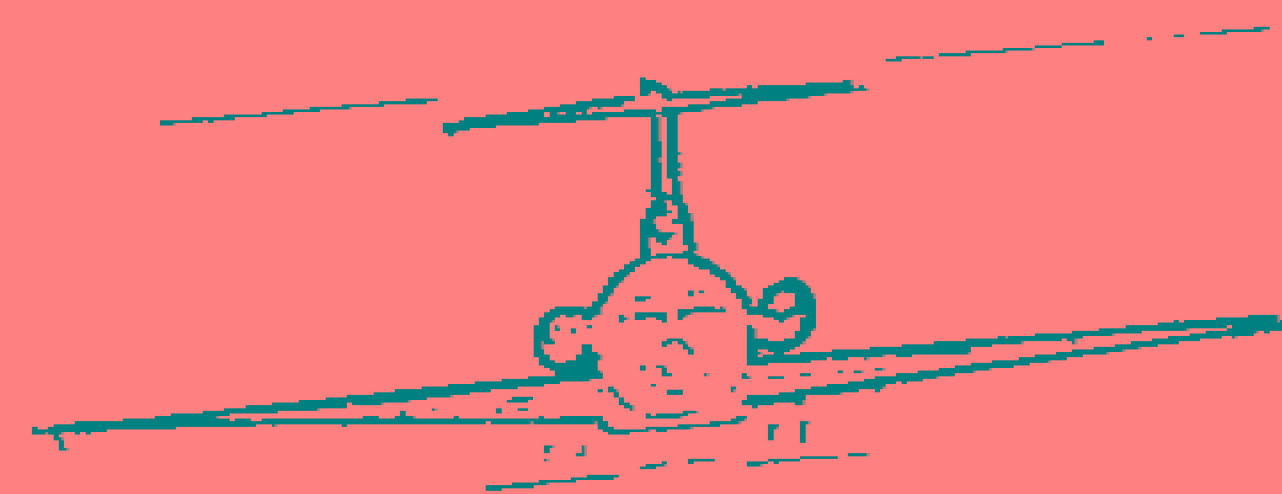
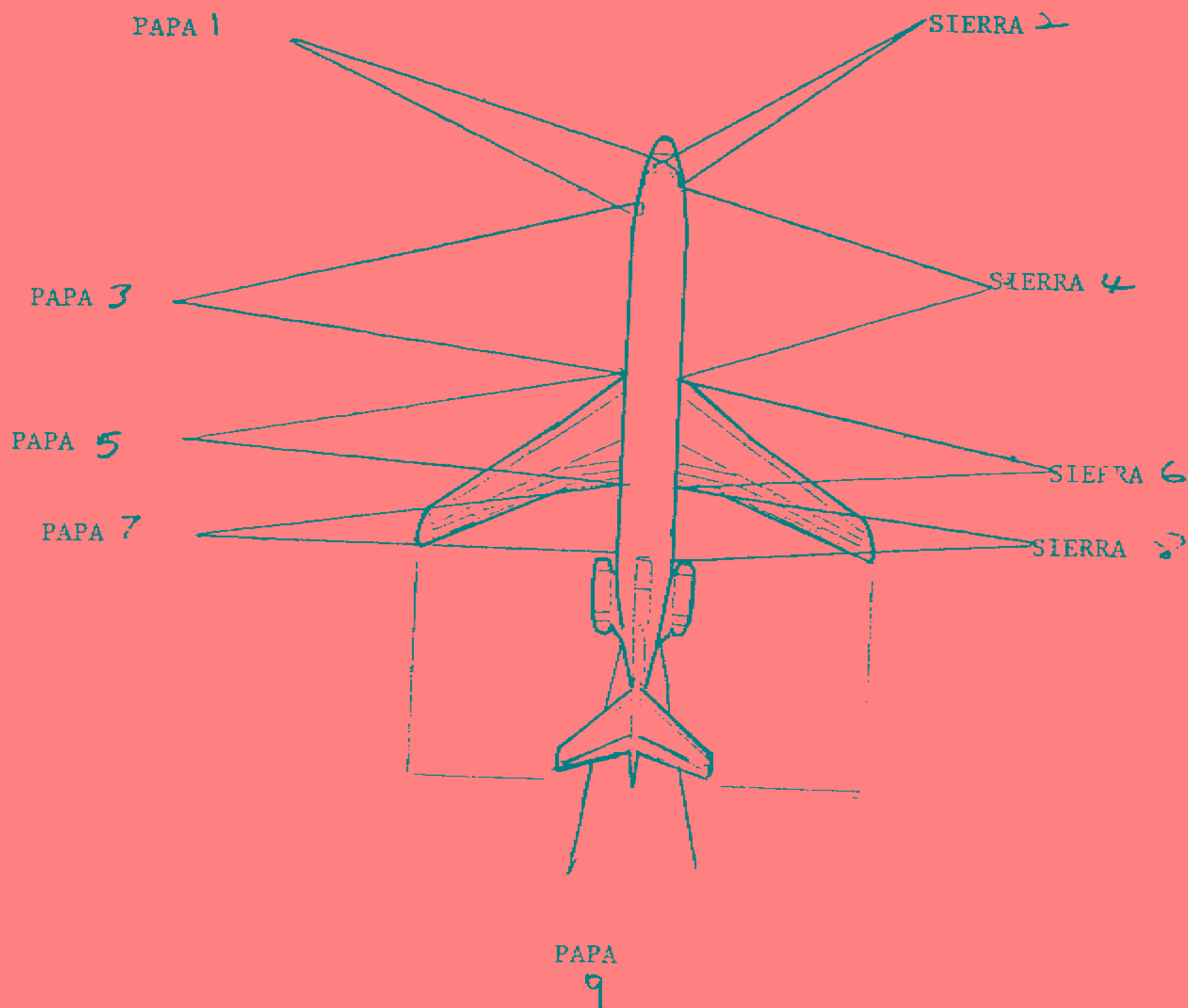
FRONT EXIT AND WINDOWS TO WING

WING WINDOWS AND WING EXITS

AFT OF WING WINDOWS AND REAR EXIT

FIRING POSITIONS CAN BE THE SAME AS OBSERVATION POSITIONS BUT CAN BE MOVE TO BEEF UP MORE SUSPECT AREAS OR TO COVER HEAVILY USED DOOR OR WINDOWS.

BOEING 727-200

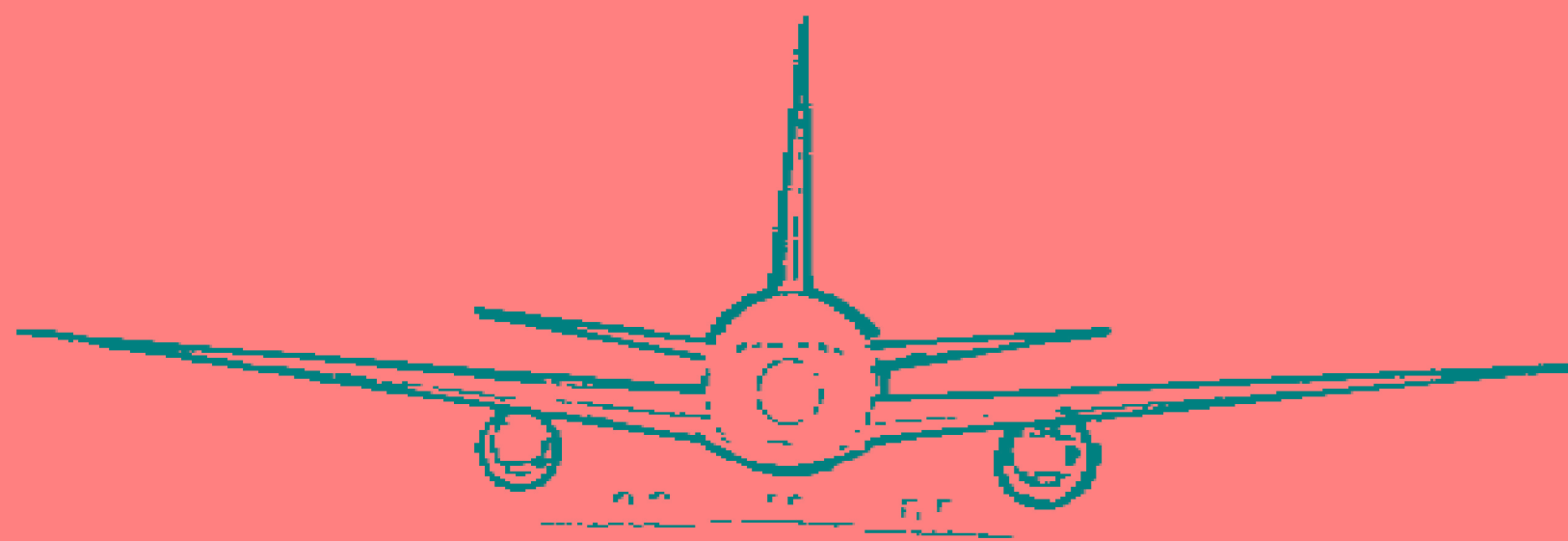
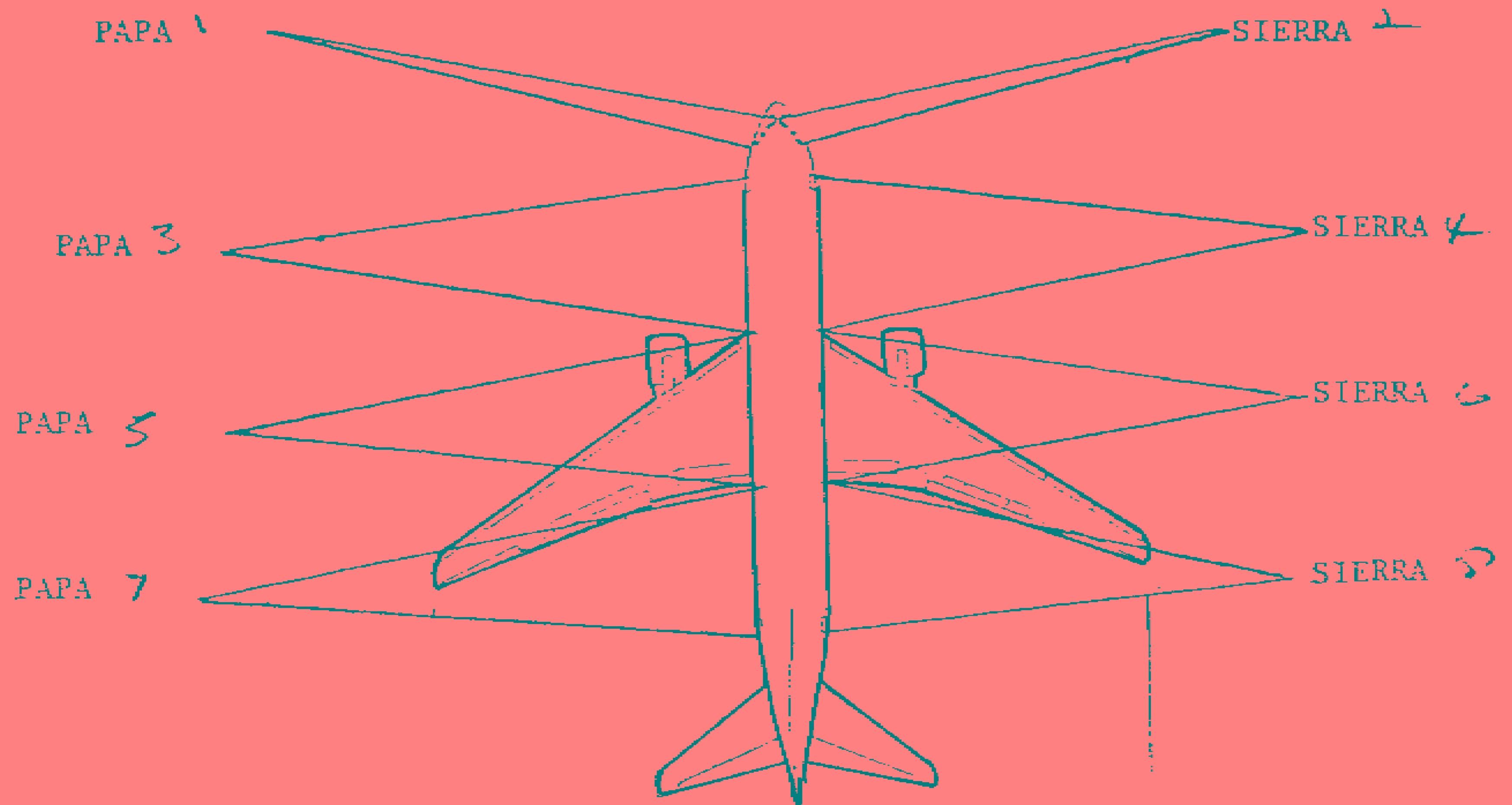


Boeing 727-200 three-turbofan, short/medium-range transport. (Pilot Press)

PAPA COCKPIT AND FRONT EXIT
 SIERRA COCKPIT
 PAPA WINDOWS TO WING
 SIERRA WINDOWS FROM COCKPIT TO LEADING EDGE OF WING
 WING EXITS AND WINDOWS OVER WINGS
 WINDOWS AFT OF WINGS AND REAR DOOR
 APA REAR RAMP

FIRING POSITIONS CAN BE THE SAME AS OBSERVATION POSITIONS BUT CAN BE MOVED TO MORE SUSPECT AREAS OR TO COVER HEAVILY USED WINDOWS OR EXITS.

BOEING 767-200



Boeing model 757-200 wide-bodied, medium-range, commercial transport aircraft. (Pilot Press)

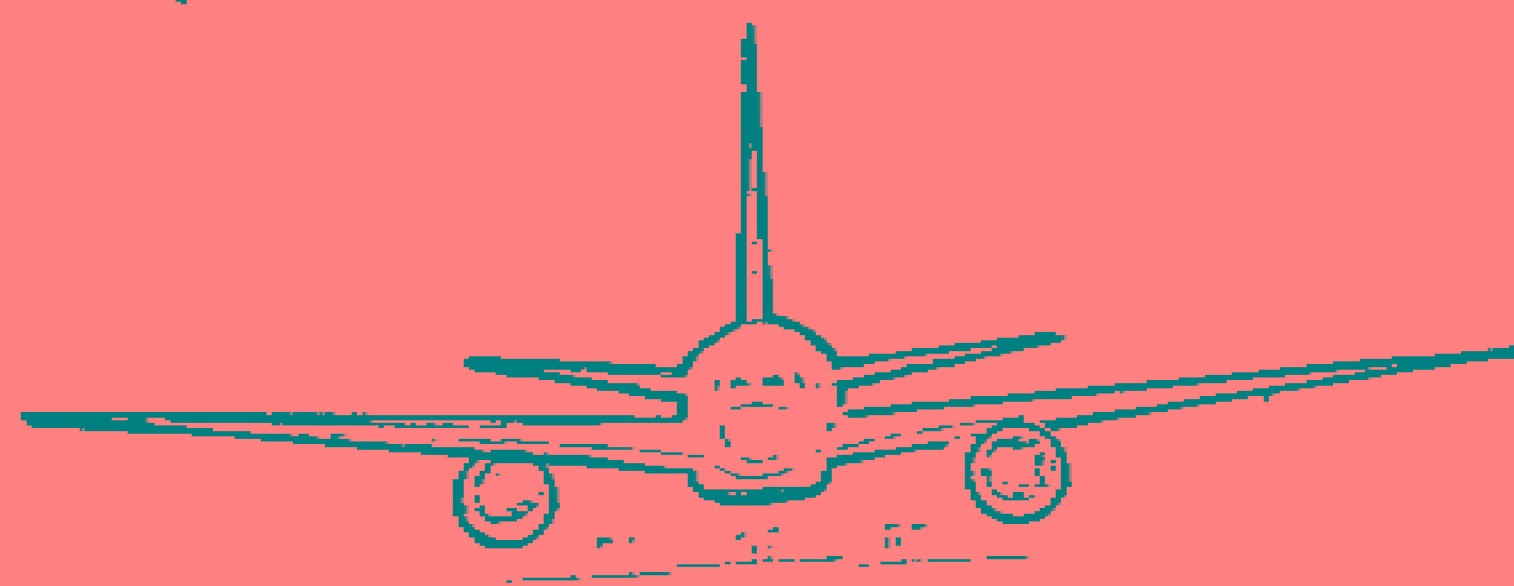
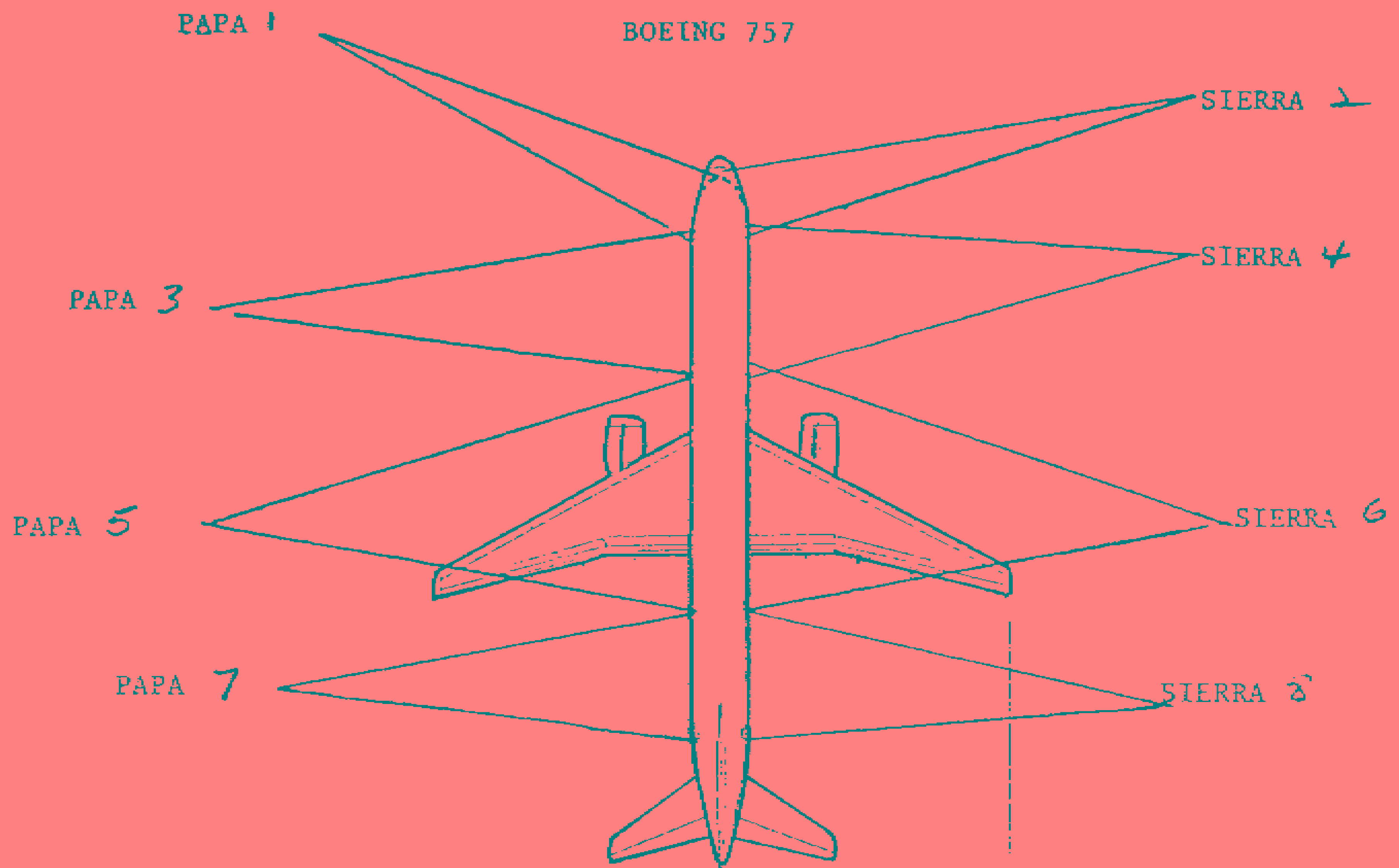
COCKPIT

FRONT EXIT AND WINDOWS TO WING LEADING EDGE

ALL WINDOWS OVER WINGS AND WING EXITS

WINDOWS AFT OF WING AND REAR EXIT

FIRING POSITIONS CAN BE THE SAME AS OBSERVATION POSITIONS BUT CAN BE MOVED TO COVER SUSPECT AREAS OR HEAVILY USED EXITS OR WINDOWS.



Boeing model 757 twin-turbofan, medium-range, commercial transport aircraft. (Pilot Press)

COCKPIT AND FRONT WINDOW

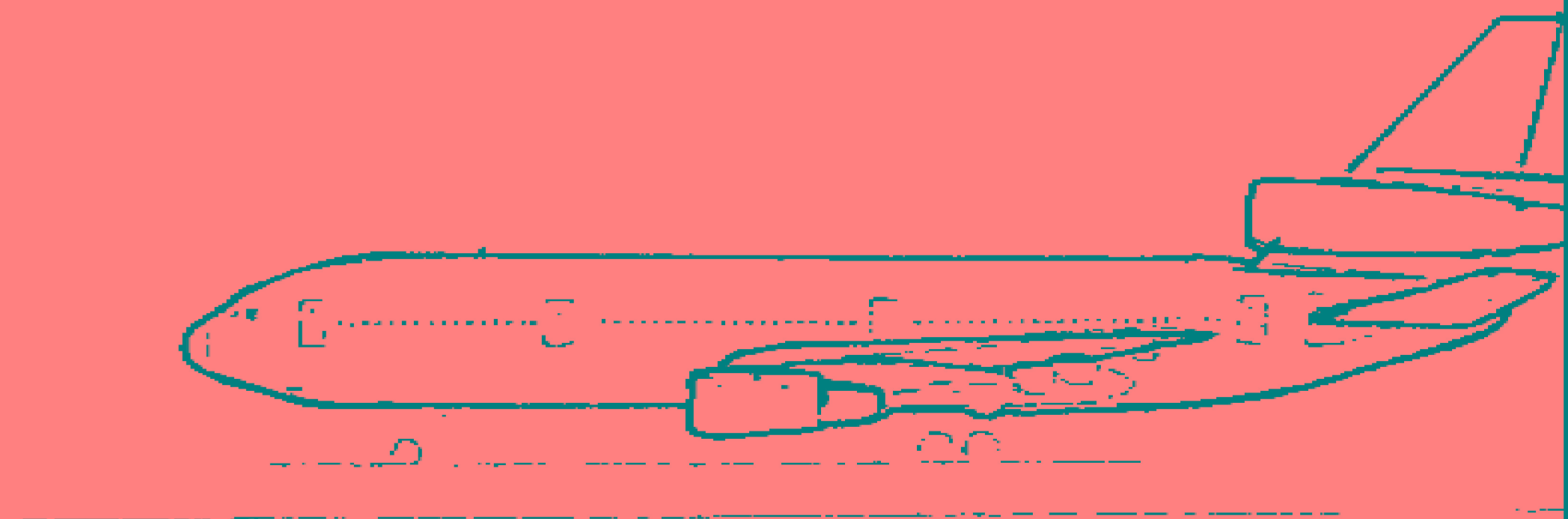
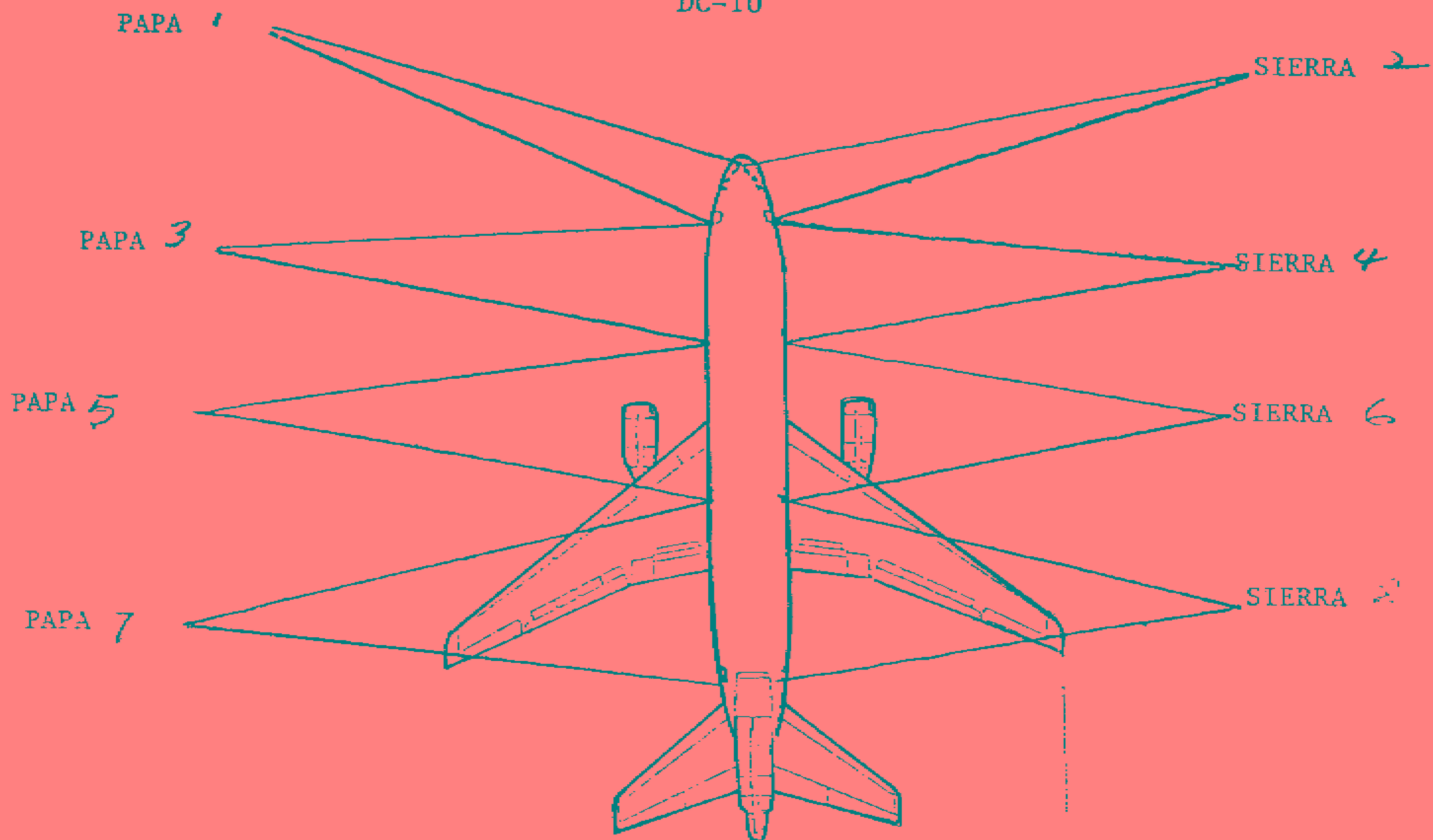
WINDOWS TO SECOND EXIT DOOR AND DOOR

WINDOWS TO THIRD EXIT DOOR AND DOOR

WINDOWS TO REAR EXIT DOOR AND DOOR

FIRING POSITIONS CAN BE THE SAME AS OBSERVATION POSITIONS BUT CAN BE CHANGED TO COVER SUSPECT AREAS OR MORE HEAVILY USED EXITS AND WINDOWS.

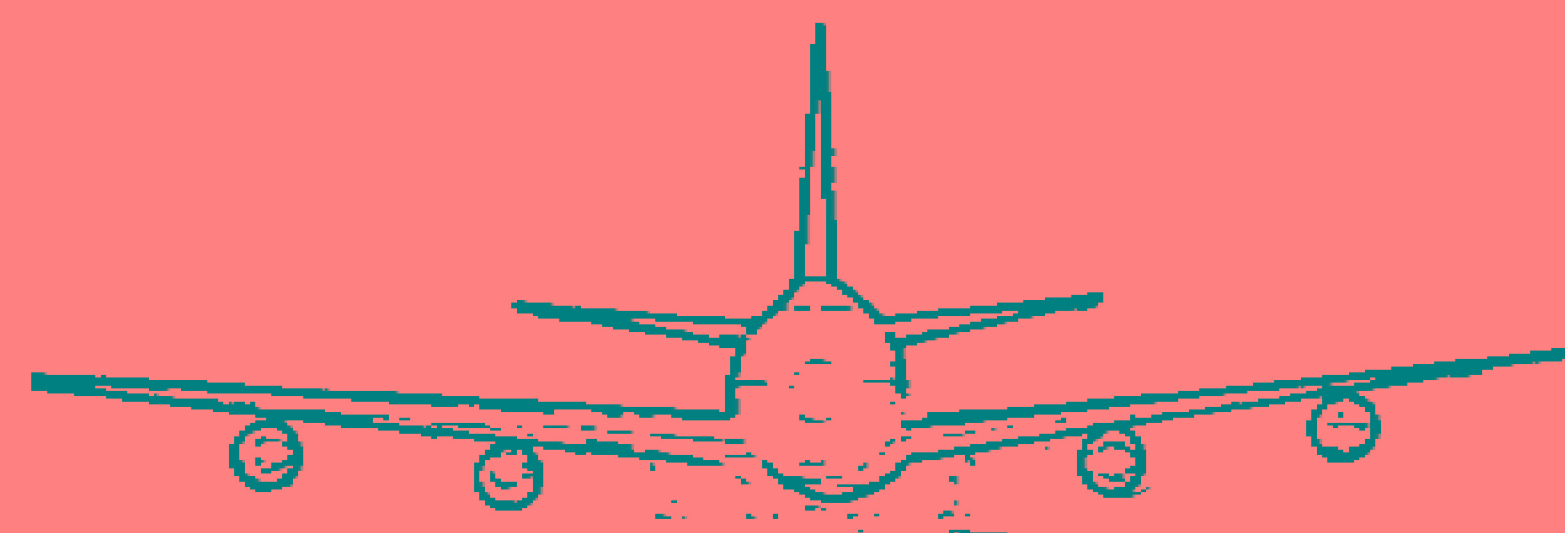
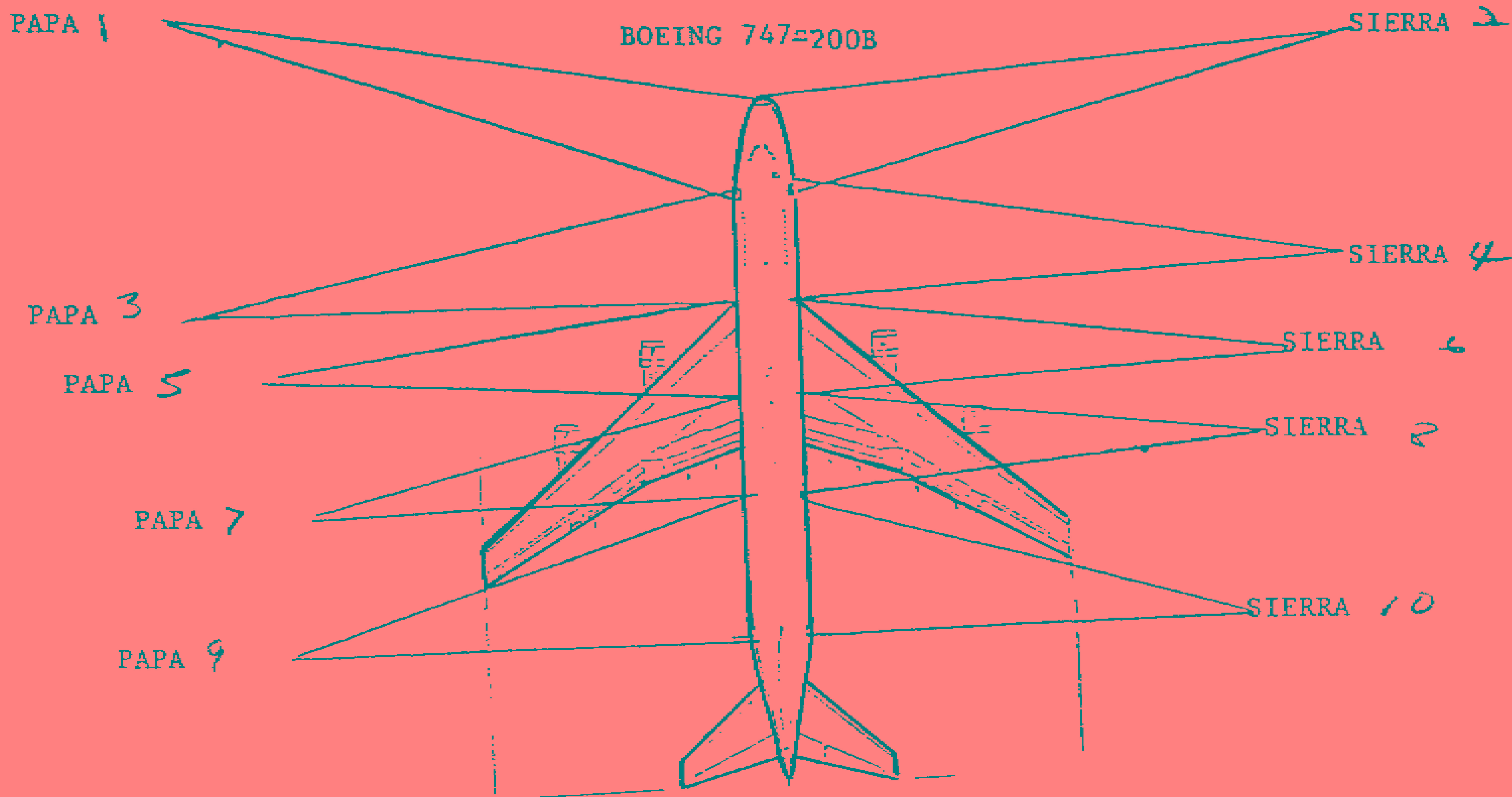
MCDONNELL DOUGLAS
DC-10



McDonnell Douglas 30 high-capacity, three-engined transport. (Pilot Press)

PAPA	COCKPIT AND FRONT EXIT
PAPA	SECOND EXIT AND ALL WINDOWS FORWARD TO FRONT EXIT
PAPA	WING EXITS AND WINDOWS TO SECOND EXIT
PAPA	REAR EXIT AND WINDOWS TO WING EXIT

FIRING POSITIONS CAN BE THE SAME AS THE OBSERVATION POSITIONS BUT CAN BE MOVED TO BEEF UP MORE SUSPECT AREAS OR HEAVILY USED EXITS OR WINDOWS.



Boeing 747-200E four-turbofan, heavy-transport aircraft. (Pilot Press)

COCKPIT AND LOWER DECK TO FRONT DOOR

FRONT DOOR TO WING LEADING EDGE AND UPPER DECK

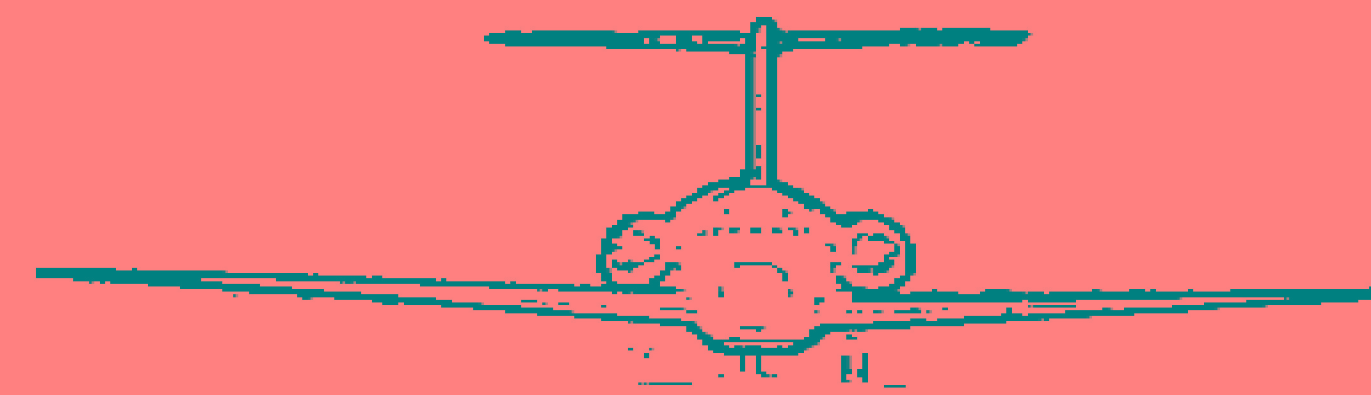
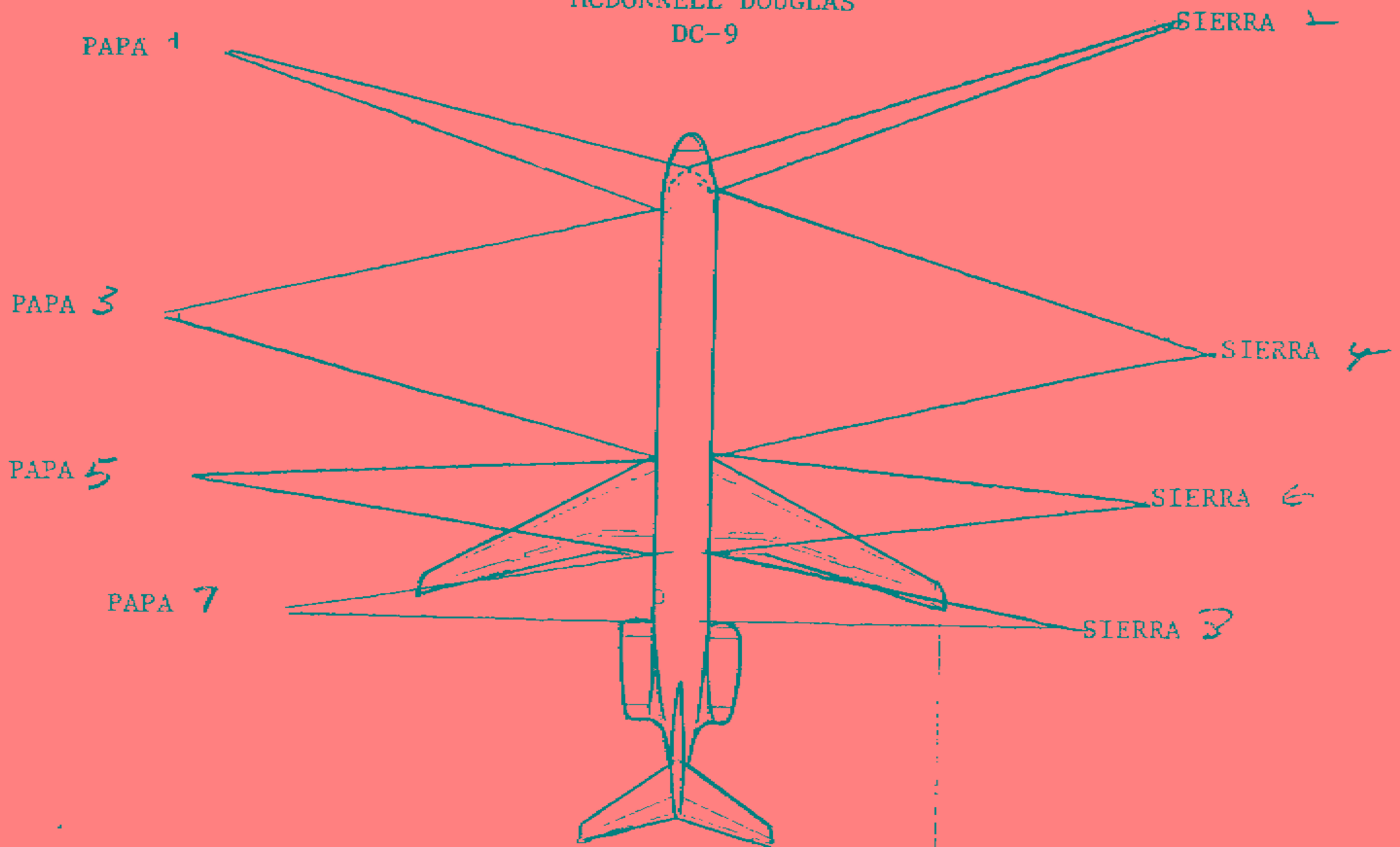
ALL WINDOWS ABOVE WING TO THE MIDDLE WING EXITS

ALL WINDOWS ABOVE WING FROM THE MIDDLE WING EXIT TO EXIT BEHIND WING

EXIT BEHIND WING TO REAR EXIT AND REAR EXIT

FIRING POSITIONS CAN BE THE SAME AS OBSERVATION POSITIONS BUT CAN BE MOVED TO MORE SUSPECT AREAS OR TO COVER HEAVILY USED EXITS OR WINDOWS.

MCDONNELL DOUGLAS
DC-9



McDonnell Douglas DC-9 Super 20 "stretched" version of this twin-turboprop transport. (Pilot Press)

PAPA COCKPIT AND FRONT EXIT

SIERRA COCKPIT

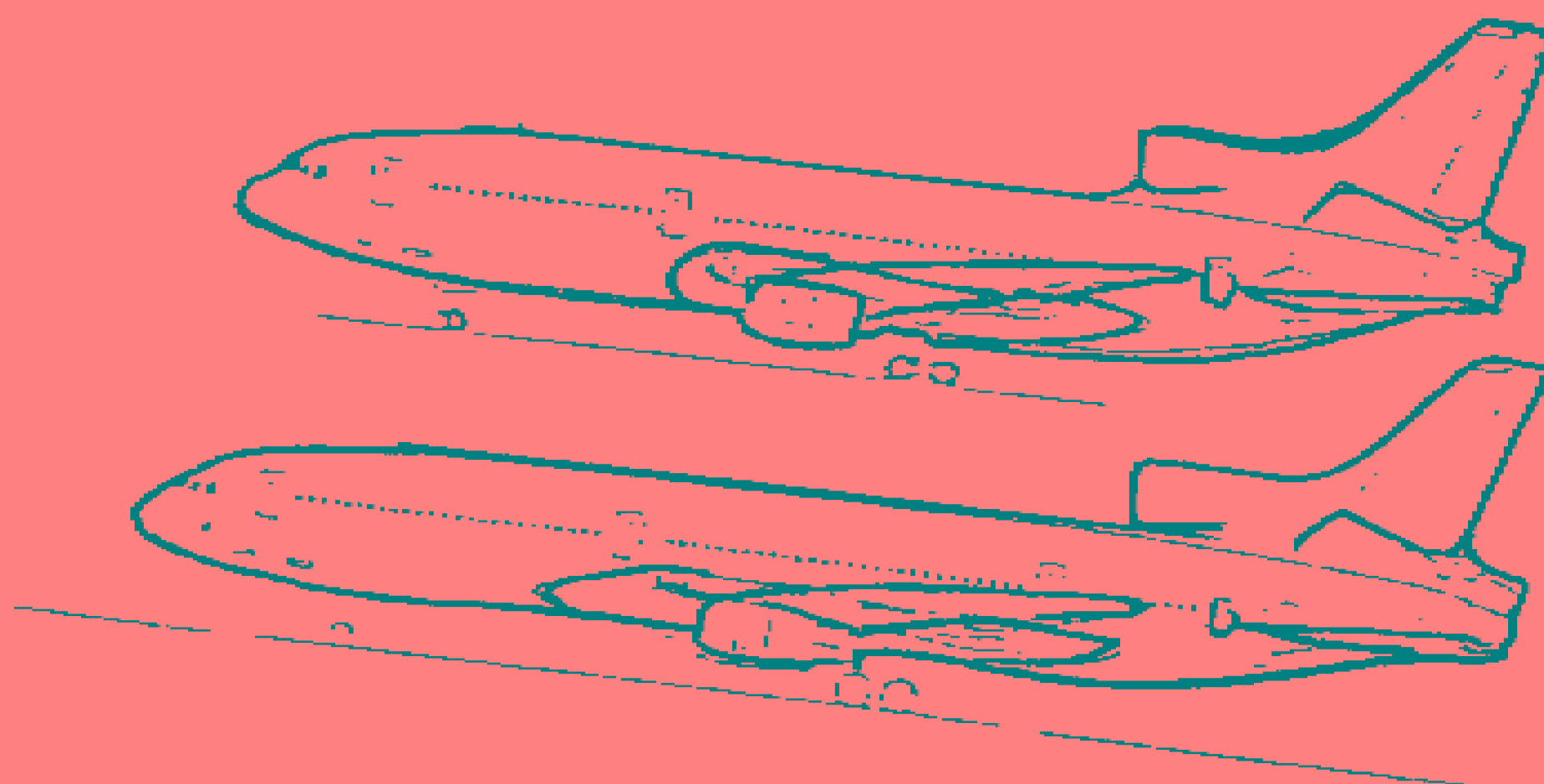
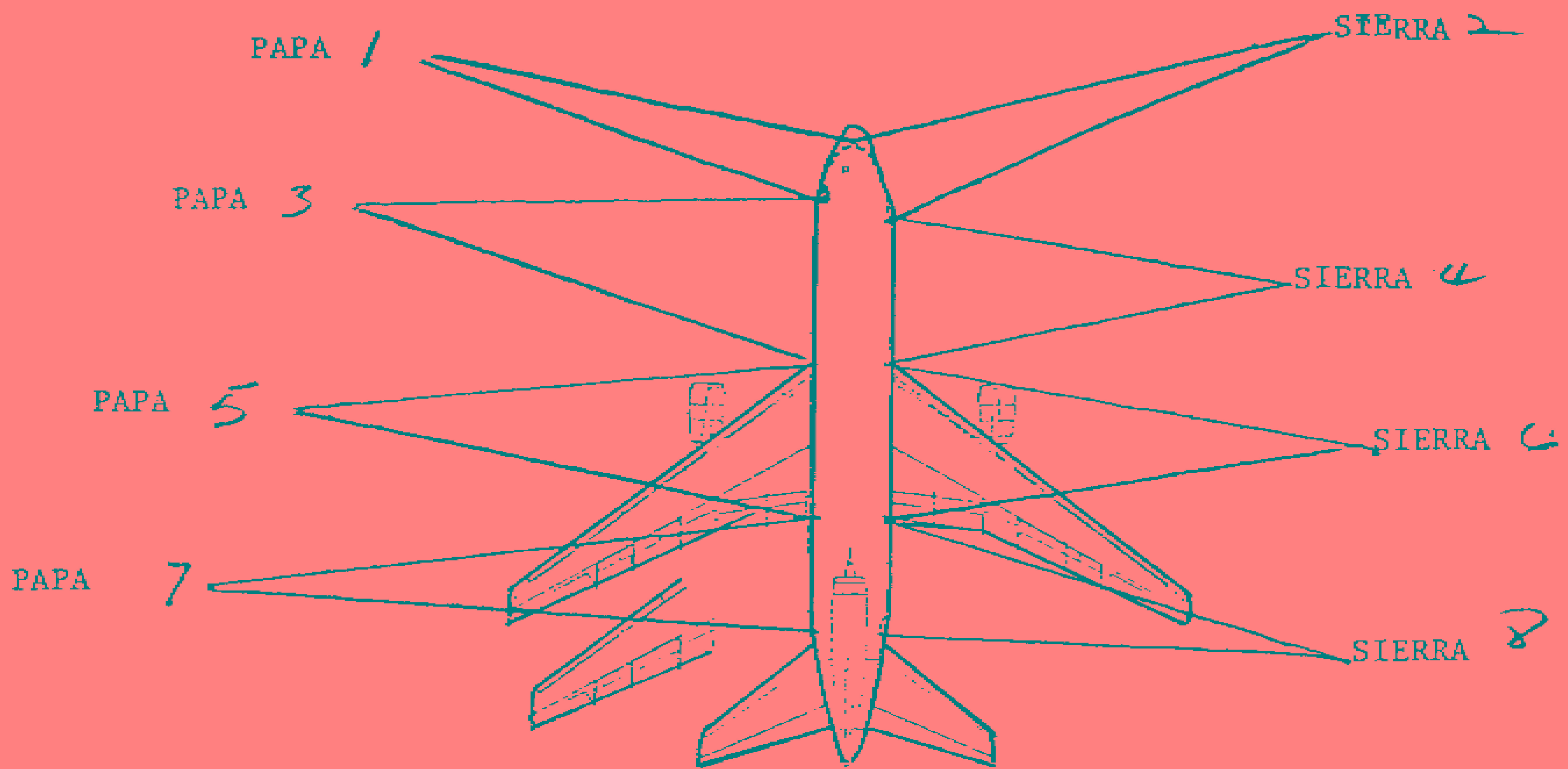
WINDOWS TO FRONT OF WING

WING WINDOWS AND EXITS

WINDOWS AFT OF WING AND REAR EXIT

FIRING POSITIONS CAN BE THE SAME AS OBSERVATION POSITIONS BUT CAN BE CHANGED TO BEEF UP MORE SUSPECT AREAS OR HEAVILY USED WINDOWS OR DOORS.

LOCKHEED L-1011



Lockheed L-1011-500 TriStar extended-range, wide-bodied transport with added side view (bottom) and scrap view of wingtip of L-1011-100. (Pilot Press)

SURVEILANCE POSITIONS AND INITIAL FIELDS OF FIRE

COCKPIT AND FRONT EXITS

ALL WINDOWS BETWEEN FRONT EXIT AND SECOND EXIT AND SECOND EXIT HATCH

ALL WINDOWS BEHIND SECOND EXIT AND OVER WINGS

WINDOWS AFT OF WING AND EITHER ONE OR TWO REAR EXITS

FIRING POSITIONS CAN BE SAME AS OBSERVATION BUT CAN BE MOVED TO BEEF UP MORE SUSPECT AREAS OR HEAVILY USED ESITS.

PICKUP ZONE AND LANDING ZONE OPERATIONS

3-1. SELECTION OF A PZ/LZ site

a. Dimensions.

(1) The landing point should be large enough to have a cleared circular area for landing of at least 25 meters for day or night. These dimensions are the minimum requirements for safety considerations. (Refer to para 3-8 for correct dimensions of cleared areas.)

(2) The landing site should have the capacity to accomodate the number, formation, and type of aircraft using the site.

b. Surface Conditions.

(1) The PZ/LZ should be free of obstacles and any loose debris that might damage the aircraft or obstruct the pilot's vision. All obstacles should be removed if possible. All obstacles that cannot be removed should be well marked. Vegetation over 18 inches in height should be cut and removed.

(2) The surface of the site should be firm enough to support the weight of the aircraft.

(3) Ground slope is determined by mathematical computation. To determine the amount of slope, the following method is used:

V = Vertical Distance

H = Horizontal Distance

V is found by computing the difference between the lowest point and the highest point on the site using the map. This number is multiplied by 57.3.

H is the length of the cleared area.

$$\frac{V \times 57.3}{H} = \text{degrees of slope.}$$

EXAMPLE: $\frac{V = 25' \times 57.3 = 1432.5}{H = 500 = 500} = 2.8 \text{ degrees rounded up to 3 degrees ground slope.}$

3-2. GROUND SLOPE REQUIREMENTS

Since landing to a sloped surface is somewhat more difficult than landing on a flat and level surface, the ground slope should be taken into consideration before beginning establishment of the site. The following rules should be

considered when the landing surface has slope. During night operations, the pilot should be advised that he will be landing on a sloped surface.

- a. Avoid landing downslope.
- b. Utility and observation type aircraft will not land when the slope exceeds 7 degrees.
- c. Large utility and cargo type aircraft will be issued an advisory when the slope is 7 to 15 degrees.
- d. Ideally, the surface of the landing point should be level.

3-3. APPROACH AND DEPARTURE DIRECTIONS

Attempt to have the aircraft approach and depart over the lowest obstacles. An obstacle ratio of 10:1 for planning purposes is used, but this may vary depending on the aviation unit's SOP. If you are unable to achieve the desired 10:1 ratio, consider whether the aircraft will be landing loaded or unloaded. If landing loaded, use the greater obstacle ratio on the approach end. If departing loaded, have the greater obstacle ratio on the departure end.

Figure 3-1. Obstacle ratio.

3-4. LANDING FORMATIONS

See figures 3-2 through 3-8

3-5. NUMBER AND TYPE OF AIRCRAFT.

- a. Section: 4 UH-1H; 3UH-60; 2 CH-47
- b. Platoon: 8 UH-1H; 6 UH-60; 4 CH-47
- c. Company: 25 UH-1H; 19 UH-60; 12 CH-47

3-6. WIND

If the wind below 1,000 feet mean sea level (MSL) exceeds 90 degrees, and deviates in excess of 45 degrees from the long axis of the landing site, the land heading should be adjusted or an aircraft advisory issued. The allowable wind velocity decreases as the density altitude increases. Because of the design of the helicopter, it can only accept a minimum velocity of wind from certain directions.

- a. Aircraft can land with a tail wind of 0 to 5 knots.
- b. Aircraft can land with a cross wind of 0 to 9 knots.
- c. Aircraft can land with a head wind of 10 knots and above.

3-7 DENSITY ALTITUDE

a. Density Altitude. Density altitude determines the actual lift capability of the aircraft for that particular day. There are three environmental factors which affect the performance of helicopters: altitude, temperature, and humidity. As any of these factors increases, the performance of the aircraft decreases. Optimum aircraft performance is obtained during a cool day with the field elevation as close to sea level as possible and with relatively low humidity.

b. Marking of a PZ/LZ.

(1) Helicopter landing points are categorized by size to accommodate different types of aircraft. The size of the landing point to be used is determined by the type aircraft employed, the aircraft's mission (troop lift, slingload, internal cargo), and the extent of coordination with the supporting aviation unit. The five sizes of landing points are indicated below and are applicable to both day and night operations.

<u>Size</u>	<u>Cleared Area Diameter</u>
1	25 meters
2	35 meters
3	50 meters
4	80 meters
5	100 meters

(2) The landing point size for the different aircraft is indicated below. The distance between landing points is equivalent to the diameter of the cleared area.

<u>Type Aircraft</u>	<u>Landing Point Size</u>
OH-58	1
UH-1H	2
UH-60	3
AH-1G	2
CH-47	4
CH-54	4
CH-53	4
AH-64	3

NOTE: When integrating a slingload point with a landing site, the slingload point will normally occupy the area considered to be the last landing point in the formation. If the slingload aircraft is different in type than the landing aircraft, the distance from the center of the last landing point to the center of the slingload point will be 100 meters. If the slingload aircraft is of the same type as the landing aircraft, the distance between

the center of the last landing point and the center of the slingload point will be equivalent to the diameter of slingload point. In either case, the slingload point will be the last point in the formation. The slingload point will always be either a size 4 or size 5 landing point, regardless of type aircraft transporting slingloads.

(3) The position of the signalman is approximately 40 meters to the aircraft's right front for landing aircraft.

NOTE: These dimensions are general guidelines and may change depending on the supporting aviation unit's SOP and the extent of coordination.

9. Chalk Numbers.

HELICOPTER FORMATIONS AND CHALK NUMBERS		
Staggered Trail Left	Diamond	Staggered Trail Right
Heavy Left Formation	Vee	Heavy Right Formation
Echelon Left	Trail	Echelon Right

Figure 3-8. Formations with chalk numbers

3-9. MARKING TOUCHDOWN POINTS

a. Daylight. The number one touchdown point is marked by a signalman. However, the aviation unit SOP will normally dictate how the site is to be marked during daylight.

b. Night. The number one touchdown point is marked with an inverted Y or a landing T. The inverted Y is the most preferred method.

(1) Inverted Y. The Y is best used for an approach initiated from terrain flight altitudes. The desired touchdown point is midway between the front two lights with the fuselage of the aircraft aligned with the stem lights. A minimum of four lights is used.

INVERTED Y

Landing Direction

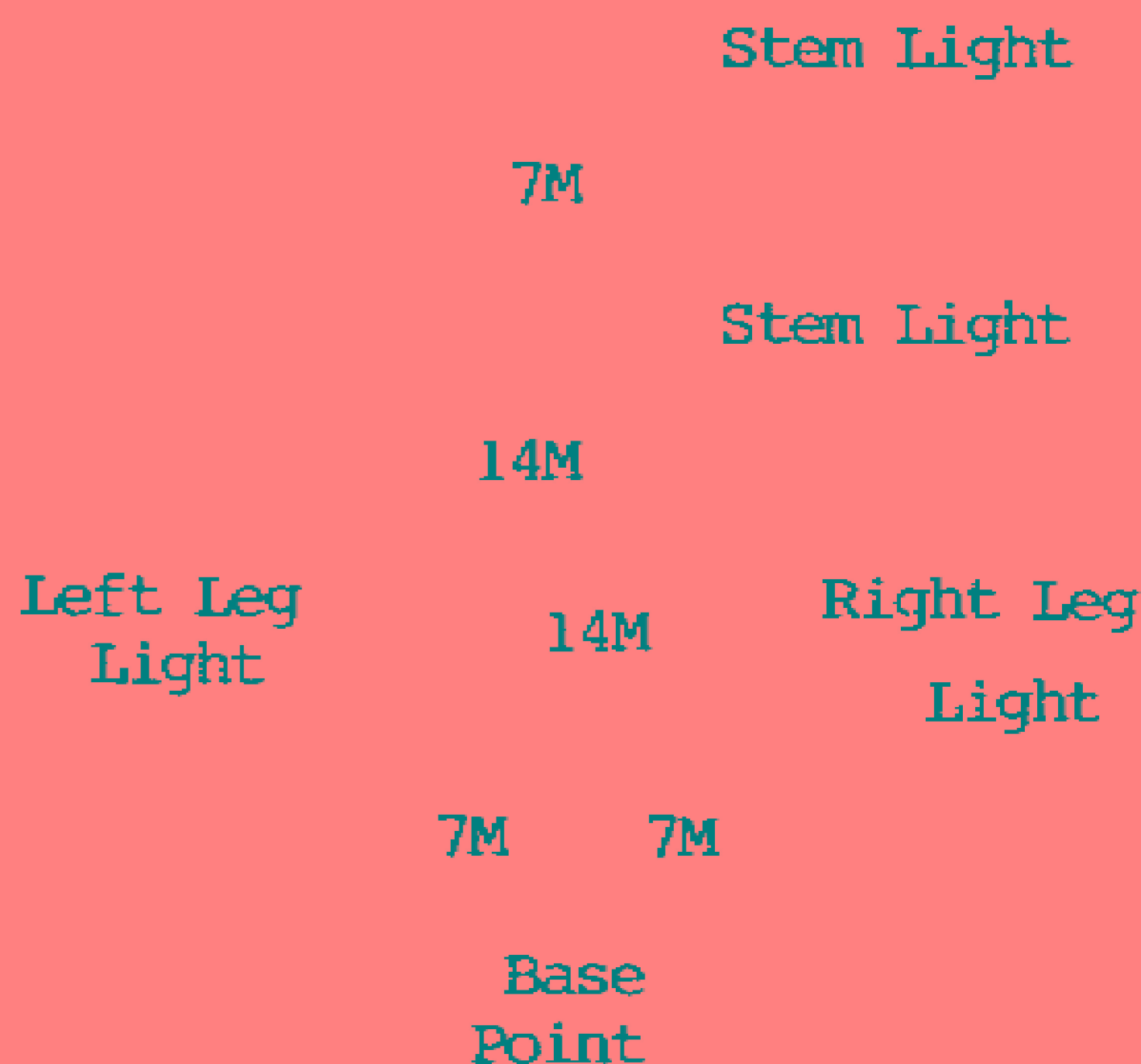


Figure 3-9. Inverted Y.

(2) Landing T. The T is best used for approaches initiated from air altitudes above 500 feet above ground level (AGL). The apparent distance between the lights in the stem of the T can be used as a reference for maintaining a constant approach angle. The approach should be terminated in the upper left portion of the T.

LANDING T

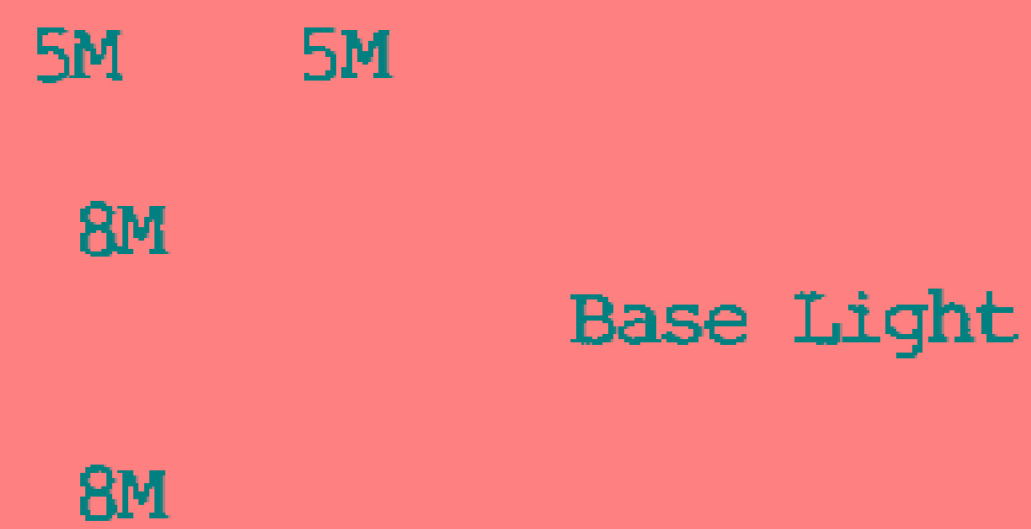


Figure 3-10. Landing T.

(3) Additional touchdown points

(a) Utility aircraft. Marked with 2 Lights 5 meters apart.

(b) Cargo Aircraft. Marked with 2 lights 10 meters apart.

3-10 PLACEMENT OF VAPI

When a visual approach path indicator (VAPI)* is used, it will be placed according to the following:

*NOTE: VAPI must be checked after each departure.

(1) Inverted Y. The Y is best used for an approach initiated from terrain flight altitudes. The desired touchdown point is midway between the front two lights with the fuselage of the aircraft aligned with the stem lights. A minimum of four lights is used.

INVERTED Y

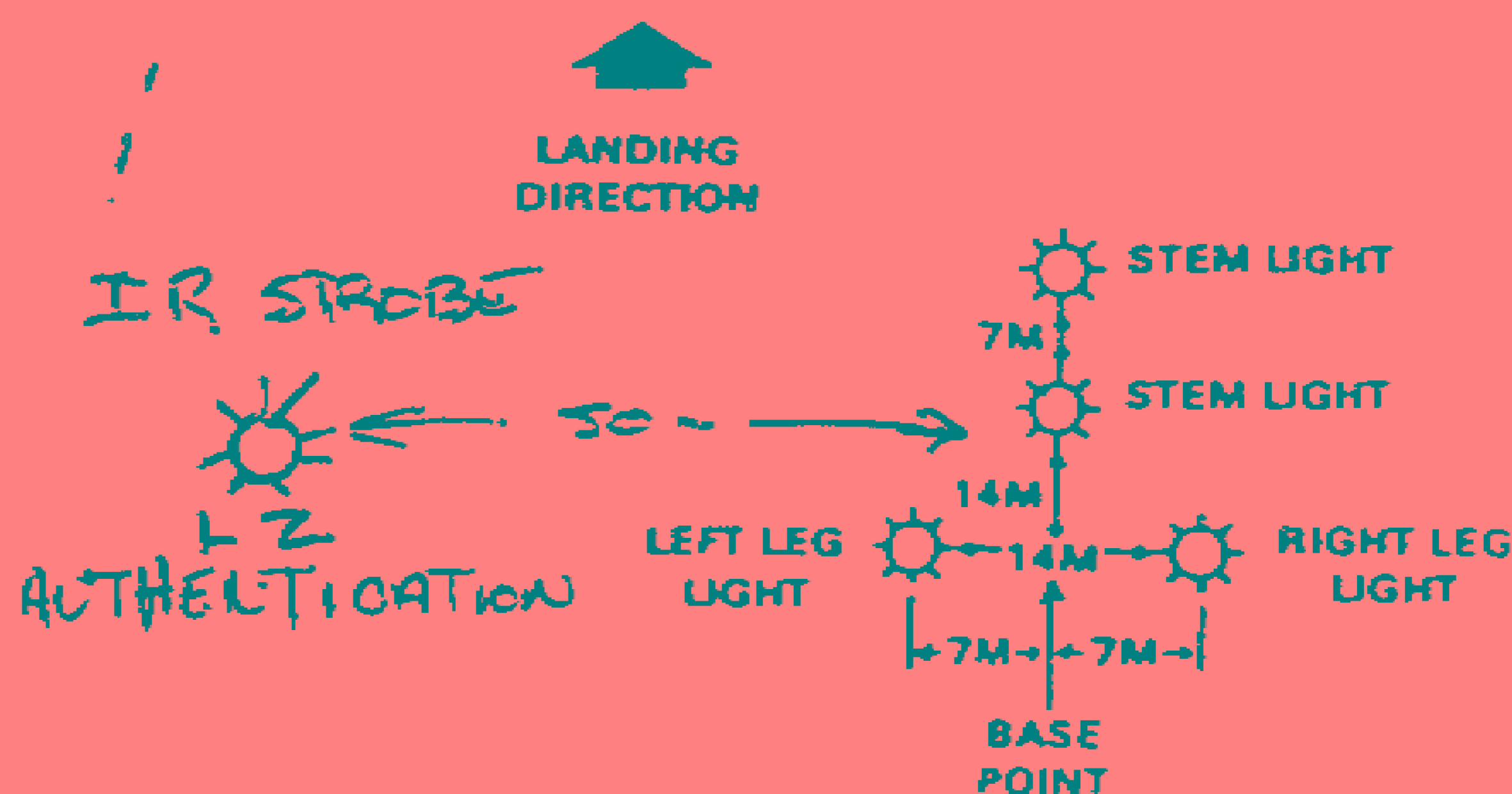


Figure 3-9. Inverted Y.

(2) Landing T. The T is best used for approaches initiated from air altitudes above 500 feet above ground level (AGL). The apparent distance between the lights in the stem of the T can be used as a reference for maintaining a constant approach angle. The approach should be terminated in the upper left portion of the T.

LANDING T

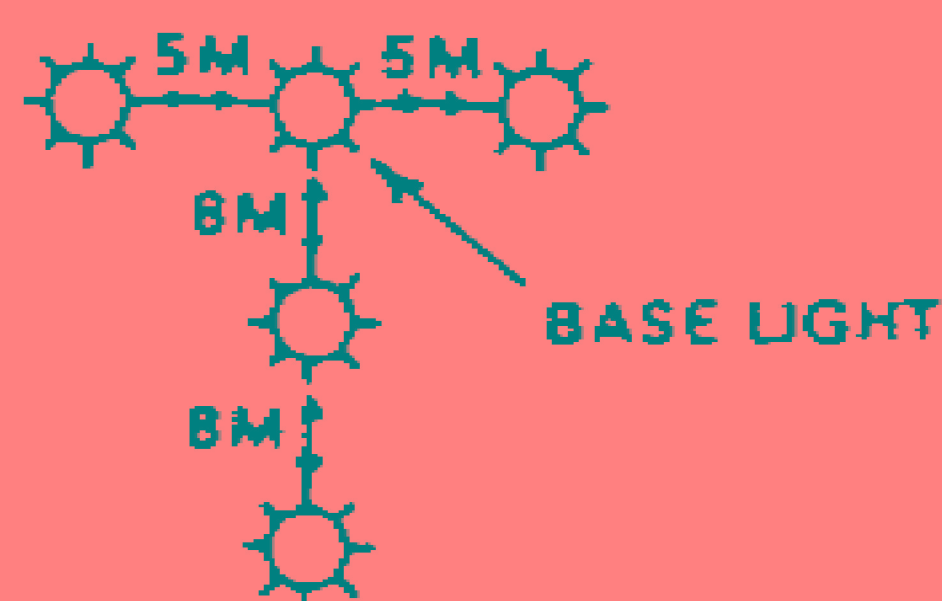


Figure 3-10. Landing T.

(3) Additional touchdown points.

(a) Utility aircraft. Marked with 2 lights 5 meters apart.

a. Inverted Y.

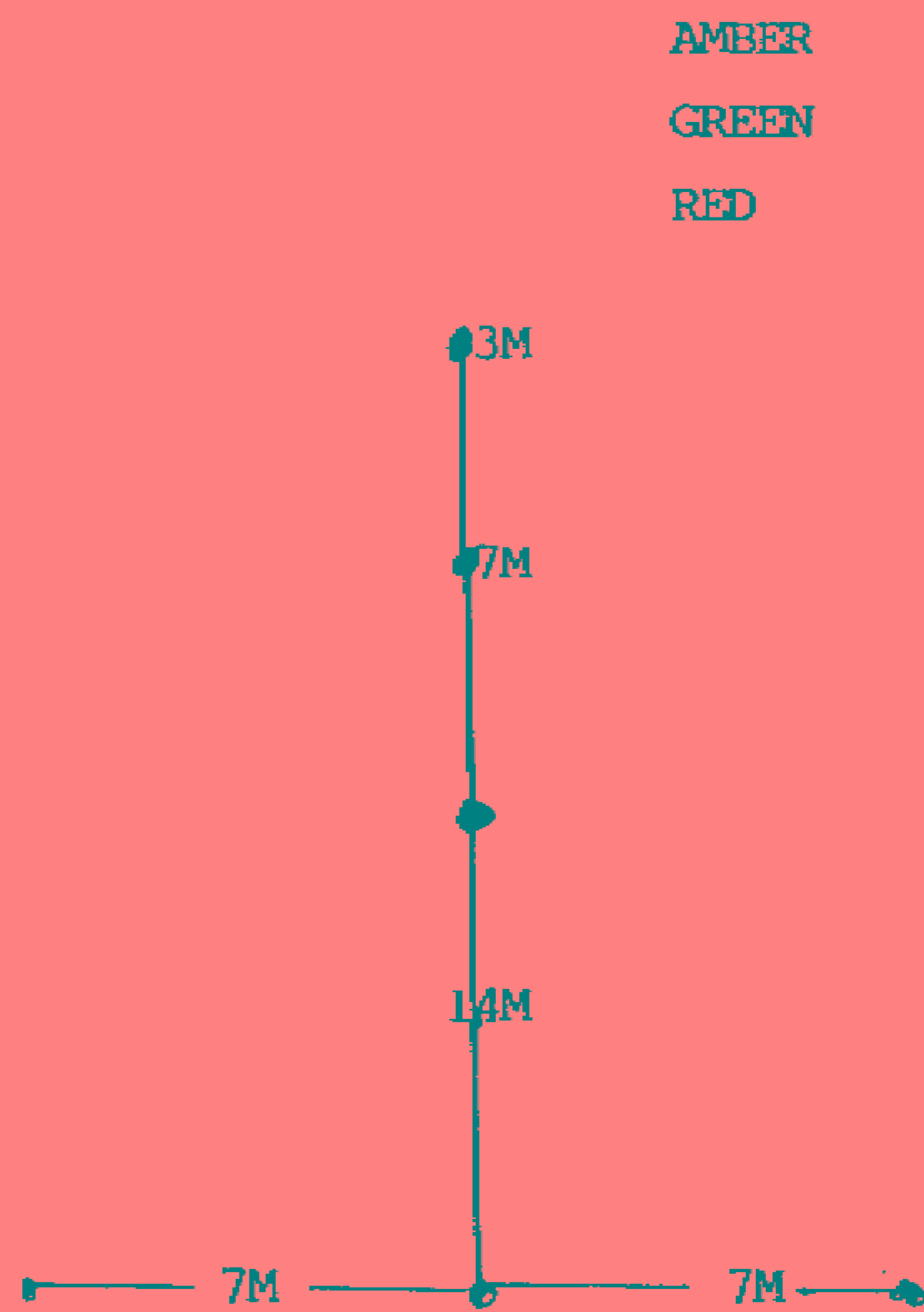


Figure 3-11. VAPI when used with Y.

